

BALDWIN COUNTY SEWER SERVICE L.L.C.
Post Office Box 1628
Foley, Alabama 36536



STANDARD SPECIFICATIONS
FOR
SANITARY SEWER SYSTEMS AND PUMPING
STATION CONSTRUCTION

REVISED OCTOBER 2020



STANDARD SPECIFICATIONS

DIVISION I

GENERAL INFORMATION AND REQUIREMENTS

1.01 BALDWIN COUNTY SEWER SERVICE'S STANDARD SPECIFICATIONS:

Copies of these Standard Specifications for Sanitary Sewers and Sewage Pumping Stations may be found online.

1.02 JURISDICTION:

These Standard Specifications shall apply to all proposed wastewater mains and pumping stations to be constructed by any person, firm or corporation and eventually be owned, operated or maintained by the Baldwin County Sewer Service, L.L.C. (BCSS).

- CITY OF SPANISH FORT

Within the City of Spanish Fort, Alabama, BCSS Standard Specifications and the 10 State Standards Recommended Standards for Wastewater Facilities, latest edition, shall be required along with the City's requirements and approvals for the construction and installation of wastewater mains and pumping stations.

1.03 PURPOSE:

These Standards and Specifications are adopted to establish minimum acceptable standards for the design and construction of wastewater collection and transmission facilities constructed by any person, firm or corporation and eventually to be owned, operated or maintained by the Baldwin County Sewer Service such facilities include gravity sewers, wastewater force mains, low pressure sewer systems, wastewater pump stations, and miscellaneous related appurtenances associated with any such systems or combinations thereof.

1.04 STANDARDS FOR PLANS:

Plans for sanitary sewers, and other appurtenances to the Baldwin County Sewer Service, L.L.C. sewer systems shall clearly define the work and all details shall be in conformance with the Standards. Baldwin County Sewer Service, LLC reserves the right to reject any plans that may on their face appear to conform to these specifications if the circumstances to which they are attempted to be applied are not best practice or they pose, in Baldwin County Sewer Service, LLC sole opinion too great an environmental hazard.

- A. Datum: All elevations on Plans are to NAVD 1988. All bearings are to NAD 1983.
- B. Locality Maps: Locality maps, showing the area of the county in which the project is located, shall be included in all sets of Plans.

- C. Review and Approval of Plans: Copies of all Plans must be submitted to the BCSS for approval prior to construction of any or all sewer system connected to BCSS sewer system.

1.05 PROJECT SUBMITTAL REQUIREMENTS

The following requirements apply to sanitary sewer facilities for all new sewer projects submitted to the BCSS for review, approval and maintenance by any person, firm or corporation. The sewer system for new projects will not be accepted unless the project sewer plans have been approved by Baldwin County Sewer Service or a Baldwin County Sewer Service representative in writing with reference to the project.

A. General:

1. Submit three sets of plans that have an Alabama Registered Professional Engineer's Seal and/or signature and registration number affixed to the cover sheet of each set. Digital copies of these plans may also be requested.
2. All material and construction shall be in strict conformance with the Standard Specifications, latest addition.
3. The plans will be reviewed by a Baldwin County Sewer Service representative. The plans may be returned with comments that must be addressed before the plans will be accepted. Comments can be specific to the project and may vary from the Standard Specifications.
4. Baldwin County Sewer Service shall be furnished with permanent easements for sewer facilities not located in public right-of-way. The minimum width of easements shall be 15 feet. Easements shall be submitted in a form satisfactory to Baldwin County Sewer Service, LLC. Easement descriptions shall be prepared by a professional land surveyor licensed in the State of Alabama, and shall conform to the Minimum Surveying Technical standards for Land Surveying as adopted by the Alabama Board of Registration for professional engineers and land surveyors.
5. Permits required for the construction of sewer facilities located in public right-of-way shall be obtained from the city, county or state and a copy delivered to the Baldwin County Sewer Service office. Permits are to be submitted and approved prior to the start of construction.
6. Where future phases of construction are planned, two copies of the Master Development Plan shall be submitted to the Baldwin County Sewer Service office.
7. Baldwin County Sewer Service, L.L.C. requires that sewer facilities serving new projects be designed and constructed such that they may be extended to serve any future development as a result of cutouts from or additions to the initial and subsequent development. The total cost of sewer facilities to serve such cutouts, subdivisions, or additions shall be at the expense of the developer. Should redesign of these facilities be required, the revised Plans shall be submitted for review and approval by Baldwin County Sewer Service, LLC.

1.06 BALDWIN COUNTY SEWER SYSTEM ACCEPTANCE CRITERIA

The following guidance is provided to assist Developers/Owners in securing Baldwin County Sewer Service, LLC acceptance of sewer projects.

A. Pre-Construction

The Developer/Owner shall schedule a pre-construction conference to be attended by the Developer/Owner, Engineer, Contractor, and a Baldwin County Sewer Service Representative. A project schedule shall be provided at the conference. The Developer/Owner is responsible for assuring that a BCSS representative is provided a 24 hour notice prior to any construction of the sewer system. Baldwin County Sewer Service, LLC or its representative has the right to enter the project site and inspect the work to verify conformance with the project requirements.

B. Acceptance Criteria

1. Developer/Owner must secure any required State, USACE, etc. permits; if permit is secured in the name of Baldwin County Sewer Service, LLC the Developer/Owner must bond Baldwin County Sewer Service, LLC for work under the permit.
2. Completion of all work in accordance with approved project documents and Baldwin County Sewer Service, LLC requirements and provision of an Alabama-registered Engineer's written certification of same. (Sample Enclosed)
3. Provision of two (2) full-size sets of verifiable, As-Built drawings of the project and one set of 11 "x 17" As-Built drawings, along with a digital copy. Digital copies shall include pdf As-Built drawings, shape files, and approved submittals.
4. As-Built plans must have sewer valves dimensioned from two (2) permanent points.
5. Provision of a Engineer stamped Schedule of Values.
6. Provision of an acceptable Bill of Sale from the Developer/Owner to Baldwin County Sewer Service, LLC for the subject sewer facilities. (Sample Enclosed)
7. Provision of an acceptable blanket release of any/all liens on the project. (Sample Enclosed)
8. On gravity sewer projects, each service laterals must be marked by northing, easting, and elevation. This information must be provided to Baldwin County Sewer Service, LLC.
9. Provision of copies of successful pressure test charts on the projects containing force main.
10. Internal inspection video of gravity sewer projects described in the Standard Specifications.
11. As may be applicable, provision of documentation that streets have been dedicated to the public and/or easements acceptable to Baldwin County Sewer Service, LLC have been granted. (Sample Enclosed)
12. Provision of Warranty/Maintenance Bond for all work in effect for one (1) year after Final Acceptance of the project by Baldwin County Sewer Service, LLC. Surety must be acceptable to Baldwin County Sewer Service, LLC (Sample Enclosed)

Please contact Baldwin County Sewer Service, LLC should there be any questions regarding the form of the required submissions or to obtain sample documents.

A requirement surviving Final Acceptance by Baldwin County Sewer Service, LLC of the sewer facilities in the project shall bind the Developer/Owner to conduct an inspection of such facilities prior to the expiration of the Maintenance Bond (the Eleven-Month Inspection). Such Eleven- Month Inspection shall be attended by the Developer/Owner, Engineer and Baldwin County Sewer Service, LLC. The Engineer shall identify any project

deficiencies for correction by the Developer/Owner and shall document it in a written report to Baldwin County Sewer Service, LLC. Such report will include a schedule for the remedy of any deficiencies. Should no deficiencies be noted or upon acceptable correction of noted deficiencies, the Engineer shall so certify to Baldwin County Sewer Service, LLC.

Conformance with above guidance should expedite the approval and acceptance of a project by Baldwin County Sewer Service, LLC. The Developer/Owner should keep Baldwin County Sewer Service, LLC informed of progress throughout the prosecution of the project by provision of timely, written project schedules updates. Should Baldwin County Sewer Service, LLC be able to provide any assistance or information please come by our office or call us at 251-971-3022.

SEWER INFRASTRUCTURE

BILL OF SALE & EASEMENTS

STATE OF ALABAMA
COUNTY OF BALDWIN

KNOW ALL MEN BY THESE PRESENTS that _____, (hereinafter referred to as the "Grantor"), the owner of the Sewage Collection System hereinafter described, for and in consideration of the sum of TEN AND NO/100ths Dollars (\$10.00) and other good and valuable considerations to Grantor in hand paid by BALDWIN COUNTY SEWER SERVICE, L.L.C., (hereinafter referred to as "Grantee"), the receipt and sufficiency of which is hereby acknowledged, does hereby GRANT, BARGAIN, SELL, CONVEY, TRANSFER, SET OVER AND ASSIGN unto Grantee, and its successors and assigns, all that property pertaining or related to the Sewage Collection System, which includes all sewage transmission lines, lift stations, pumps, valves, appurtenances and appliances, located in, on or under the real property located in Baldwin County, Alabama described on the plat of _____, residential subdivisions in Baldwin County, Alabama as recorded in the Probate Court Records of Baldwin County, Alabama including without limitation Slide Nos. (_____) and (_____) respectively; Further, Grantor does hereby grant, bargain, sell and convey a nonexclusive perpetual easement on, over or under the common area ground and utility easement designation on the recorded map or plat of _____, a residential subdivision to erect, maintain and use sanitary sewer collection and transport facilities for the purpose of conveyance and transport of sewage to the Grantee's main collection lines over the common property and utility easements reflected on the Subdivision Record Map or Plat or as may hereafter appear on any plat of record subject to the Protective Covenants of _____, a residential subdivision, without limitation upon the forgoing Grantor specifically grants, bargains and sells to Grantee a nonexclusive easement over and across a 20 foot easement over, across and under the alley, utility and the drainage easement on the rear line of each lot that the map or plat shows such an easement for Grantee to use for sewer facility installation and access together with the right to construct within such reserved easement such other sewer collection facilities so long as it does not impede or hinder surface water drainage across the property described in Slide Nos. (_____) and (_____) sufficient to maintain, repair and/or replace any of the Sewage Collection System transferred hereby.

TOGETHER WITH ALL AND SINGULAR the tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining.

TO HAVE AND TO HOLD, the same unto the Grantee, BALDWIN COUNTY SEWER SERVICE, L.L.C., and its successors and assigns forever.

Grantor covenants that it is the lawful owner of the Sewage Collection System and lawfully seized of an indefeasible estate in fee simple in same; that Grantor is in quiet and peaceable possession of same; that same are free and clear of all liens and encumbrances, and that Grantor will forever WARRANT AND DEFEND the title to the Sewage Collection System and the peaceable possession thereof against all lawful claims and demands of all persons.

IN WITNESS WHEREOF, the Grantor, _____, has set its hand and seal on the _____ day of _____, 2020.

BY: _____

ATTEST:

STATE OF ALABAMA)
COUNTY OF BALDWIN)

I, the undersigned authority, a Notary Public within and for said County and State, hereby certify that _____, whose name as _____ of _____ is signed to the foregoing conveyance and who is known to me acknowledged before me on this day that being informed of the contents of said conveyance, he, as such representative and with full authority, executed the same voluntarily and with full authority to do so on the date the same bears date.

Given under my hand and seal on this the ____ day of _____, 2020.

NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

The following information is furnished in accordance with Code of Alabama 1975, Section 40-22-1, and is verified by the signature of the Grantor(s) below:

Grantor's name: _____

Mailing address: _____

Grantee's name: _____

Mailing address: _____

Property Address: _____

Date of Sale: _____

Total Purchase Price: _____

Or Actual Value: _____

Or Assessor's Market Value: _____

The purchase price or actual value claimed can be verified in the following documentary evidence:

(check on) _____ Bill of Sale, _____ Sales Contract, _____ Closing Statement,

_____ Appraisal, _____ other

Date: _____

Grantor(s) Signature

EXHIBIT A
TO
BILL OF SALE

Engineer Certification

This letter is our statement that sewer utilities for _____
Subdivision have been designed in accordance with, and have been constructed in conformance
to the current Baldwin County Sewer Service, LLC Standard Specifications.

_____ Signed

_____ Name

_____ Title

_____ Dated

SEAL

GUARANTEE

Developer / Owner _____ for
_____ Subdivision guarantees to
Baldwin County Sewer Service, LLC that should Contractor and/or Bonding Company fail to perform
the obligations set forth in that certain Maintenance Bond dated _____ in
favor of Baldwin County Sewer Service, LLC in the principal amount of \$ _____,
then Developer/Owner shall perform said obligations. Effective _____

By: _____

STATE OF ALABAMA

COUNTY OF BALDWIN

I, the undersigned Notary Public in and for said State and County, hereby certify that
_____ whose name is signed to the foregoing instrument, and who is known to
me, acknowledged before me on this day that, being informed of the contents of the instrument,
he executed the same voluntarily on the day the same bears date.

Given under my hand and seal on this the ____ day of _20__.

Notary Public-State of Alabama at Large

My Commission Expires: _____

STATE OF ALABAMA
COUNTY OF BALDWIN

LIEN WAIVER & INDEMNIFICATION FOR SEWER INFRASTRUCTURE

The undersigned has supplied, constructed, or caused to be constructed to that certain property described as:

Project / Subdivision Name: _____,

Phase #: _____, #Lots: _____

at the request of: (DEVELOPER/OWNER): _____

and, having received sufficient consideration for said above described sewer infrastructure, hereby waives any right, claim or lien against the Purchaser thereof, and agrees to indemnify and hold harmless said purchaser from any and all claims of liens or other damages claimed by any third person, business or corporation to the said purchaser-namely: Baldwin County Sewer System, LLC

Dated the _____ day of _____, 20____.

Developer/Owner

By:
Its Authorized Representative

Contractor/Supplier

By:
Its Authorized Representative

DIVISION II – CONTRACT SPECIFICATIONS

SECTION 3

SPECIFICATIONS FOR SANITARY SEWERS

3.01 SCOPE

These general and detailed specifications form a part of the Contract documents and shall govern the handling and installation of sanitary sewer mains, manholes, service connections, and accessories described herein, and as shown on the accompanying plans. Existing sanitary sewer facilities are owned and operated by the Baldwin County Sewer Service, L.L.C., hereinafter referred to as "Owner". The construction methods employed in the placement of the sanitary sewer main and appurtenances shall be in accordance with current codes, practices and specifications of the Owner.

3.02 MATERIALS

A. PVC Pipe:

1. Gravity Pipe - Plastic gravity sewer pipe and fittings shall be unplasticized polyvinyl chloride (PVC), meeting or exceeding ASTM Specification D- 3034 latest edition, Classification SDR 35. Pipe lengths shall not exceed 20 feet and provisions shall be made at each joint to accommodate expansion and contraction. All pipe and fittings shall be joined by means of an integral wall bell and spigot and sealed with a rubber gasket. This joint shall be capable of withstanding an internal hydrostatic pressure of 25 psi for one hour with no leakage. All pipes shall be green in color or have a green strip impregnated on pipe.

PVC seamless ribbed pipe shall meet the requirements of ASTM F-794 and Uni-Bell Uni B-9. The pipe shall be homogeneous and have a smooth interior with a solid cross-sectional rib exterior. Exterior ribs shall be open profile and perpendicular to the axis of the pipe to allow placement of the sealing gasket (whenever desired during construction) without field marking, beveling, sealing channels, gluing, welding, machining or additional cutting. The pipe stiffness at 5% deflection shall be a minimum of 46 psi when tested in accordance with ASTM D-2412. All pipes shall be green in color or have a green strip impregnated on pipe.

- B. Ductile Iron Pipe shall be push-on joint. All pipe shall conform to ANSI/AWWA Specifications C151/A21.51 Standard Pressure Classes. Pipe shall be made of Grade 60-42-10 iron. The interior of all pipe shall be cement-mortar lined as specified in ANSI Specification A 21.4 and the interior and exterior shall receive an approved bituminous coating. Pipe shall be centrifugally cast with minimum wall thickness associated with Pressure Class 350. All such pipe shall have a green strip impregnated or otherwise running the length of said pipe.

The pressure rating, metal thickness, net weight of pipe without lining, length of pipe, name of manufacturer, and letters "D.I." shall be clearly marked on each length of pipe.

Where it is necessary to cut new ductile iron pipe or existing cast iron pipe, in no case shall it be cut by burning, but shall be cut by saw, cutter, abrasion or other approved means.

Ductile iron fittings shall be as specified in Division III, Section 3, Paragraph 3.04 B, herein.

- C. Transitions for dissimilar pipes up to 12 inch O.D. for gravity sewer mains shall be made by use of a flexible coupling with an adapter busing and stainless steel band and clamps. Transitions from dissimilar type pipe over 12 inch O.D. shall be made by use of approved adapters specifically designed for this purpose. Joining of dissimilar pipes with concrete collars shall not be permitted except at such places where specifically approved.
- D. Manhole Steps shall be steel rods encased in polypropylene plastic and shall be of the type manufactured by M.S. Industries, Inc., or approved equal. Steps shall be Type PS-1 - PF, for precast manholes and Type PS-1-B or PS-2-BG for brick manholes. Steps shall conform to the requirements of A.S.T.M. C-478.
- E. Brick shall be hard-burned common brick meeting ASTM Specification Number C-32, Grade NA or concrete brick meeting ASTM Specification Number C-55, Grade A. Brick shall be nominal 2"x4"x8".
- F. Cast Iron Frames and Covers shall conform to the drawings in all essentials of design. All castings shall be made of clean, even grain, tough gray cast iron. The quality of iron in the castings shall conform to the current A.S.T.M. Specification A-48 for Class 30 Gray Iron Castings. Frames and covers shall weigh not less than that shown on the drawings. The castings shall be smooth, true to pattern and free from projections, sand holes or defects. The portion of the frame and cover which forms the cover seat shall be machined so that no rocking of the cover is possible the castings shall be coated with coal tar pitch varnish.

On paved streets, the frame and cover shall be set flush with the finished grade and in the plane of the paved surface. In other locations, they shall be set to the grades determined in the field by the Engineer.
- G. Class "A" Concrete shall have a minimum compressive strength at twenty-eight days of 3,000 pounds per square inch satisfying pertinent paragraphs of Alabama Highway Department Specifications for Class "A" concrete.
- H. Mortar shall be in accordance with Section 611 of the Alabama Highway Department's Standard Specifications. Mortar for inverts and seals in sewer structures shall be a 1:3 Type II Portland Cement Sand Mix, provided that hydrated lime or mortar mix is substituted for, but not to exceed ten percent (10%) by weight of the cement.

3.03 INSPECTION

- A. Material at Factory: All materials are subject to inspection and approval at the plant of the manufacturer.

All material shall meet the requirements specified and suppliers of pipe and fittings shall furnish, in triplicate, to the Engineer, an affidavit stating that all pipe and fittings furnished under this contract conform to the requirements as set forth in these specifications.

- B. Field Inspection: All pipe and accessories shall be laid, jointed and backfilled in the presence of a BCSS representative. The Contractor shall notify the BCSS representative of construction at least twenty-four (24) hours in advance before any section of sewer is checked with the "GO-NO-GO" mandrel. The mandrel must be checked no sooner than thirty (30) days after installation of sewer main. The Engineer shall give a certified certificate to the Owner that the pipe after inspection meets the Owner's specifications.
- C. Disposition of Defective Material: All material found during the progress of the work to have flaws, or other defects will be rejected and the Contractor shall promptly remove from the site of the work such defective material.

3.04 HANDLING PIPE AND ACCESSORIES

- A. Care: Pipe, fittings, valves, and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the Contractor; items shall at all times be handled with care to avoid damage. In loading and unloading, items shall be lifted by hoists or slid, or rolled on sideways in such manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on sideways must not be skidded or rolled against pipe already on the ground.
- B. At Site of Work: In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Pipe shall be retained in shipping cradles when stored along the right-of-way until pipe is ready to be laid. In no case will removal of pipe from cradles be permitted more than 24 hours in advance of placing in trench.
- C. Care of Pipe Coating: Pipe shall be handled in such manner that a minimum amount of damage to the coating will result. Damaged coating shall be repaired in accordance with the pipe manufacturer's recommendations.
- D. Bell Ends (Direction): Pipe shall be placed on the site of the work parallel with the trench alignment and with bell ends facing the direction in which the work will proceed.
- E. Pipe Kept Clean: The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Each pipe shall have a swab run through it until all foreign matter has been removed.

3.05 ALIGNMENT AND GRADE

- A. General: All pipe shall be laid and maintained to the required lines and grades; with fittings at the required locations for connecting existing service laterals; and with joints centered and spigots home.
- B. Protecting Underground and Surface Structures: Temporary support, adequate protection and maintenance of all pipelines, underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his own expense. Existing side drain pipes and curbs and gutters that interfere with the Contractor's operation shall be removed and replaced in kind at no additional cost to the Owner.
- C. Sub-Surface Explorations: Existing underground pipes and structures have been shown on the plans from existing records for the contractor's convenience. The contractor shall verify locations of existing underground pipes and structures through examination of all available records and shall make all explorations and excavations necessary to determine the location of existing pipelines, service connections, or other underground structures. This investigation shall be made in advance of any pipe laying and any damage to existing pipelines, service connections or underground structures shall be repaired by the Contractor at no additional cost to the Owner.

3.06 EXCAVATION AND PREPARATION OF TRENCH

- A. Description: The trench shall be dug to the alignment and depth required and only a minimum distance in advance of pipe laying. The trench shall be so drained that workmen may work therein efficiently.
- B. Width: The trench width may vary with and depend upon the depth of trench and the nature of the excavated material encountered, but in any case shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The minimum width of trench shall be as approved by the Engineer; the maximum clear width of trench shall be not more than two and one-half (2-1/2) feet greater than the pipe diameter at the trench bottom, unless otherwise specified by the latest OSHA requirements.
- C. Pipe Foundation in Good Soil: The trench, unless otherwise specified, shall have a flat bottom conforming to the grade to which the pipe is to be laid. The pipe shall be laid upon sound soil cut true and even so that the barrel of the pipe will have a bearing for its full length.
- D. Correcting Faulty Grade: Any part of the trench excavated below grade shall be corrected with approved material, thoroughly compacted.
- E. Pipe Foundation in Poor Soil: When the bottom uncovered at subgrade is soft and cannot support the pipe, a further depth as noted on the plans shall be excavated and refilled to pipe foundation grade as required. Material used for backfill to the elevation of the pipe will be paid for separately.

- F. Bell Holes Required: Bell holes of ample dimensions shall be dug in earth trenches at each joint to permit the joining to be made properly.
- G. Bracing: When the material through which the trench is excavated tends to fall in, run, or cave, the sides of the trench shall be braced, open sheeted or close sheeted, to an extent necessary to protect the pipe being laid. Such sheeting shall remain in place until the backfill is carried to a point at least two (2) feet above the top of the pipe. The Contractor shall exercise every precaution in removing the sheeting in order to avoid damaging the pipe. Should there be evidence that the removal of sheeting would damage the pipe, the sheeting shall be left in place and no additional compensation will be allowed therefor. The top of sheeting left in place shall be at least twelve (12) inches below natural ground. The Contractor shall place such other sheeting and/or bracing as he and his surety deem necessary to protect workmen and the public.
- H. Care of Surface Material for Re-Use: If local conditions permit their re-use, all surface materials suitable for re-use in restoring the surface shall be kept separate from the general excavation material.
- I. Manner of Piling Excavated Material: All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clear, or other satisfactory provisions made for street drainage. Also, storm drains shall be kept clear.
- J. Trenching by Machine or by Hand: The use of trench-digging machinery will be permitted except in places where operation of same will cause damage to trees, building, or existing structures above or below ground, in which case hand methods shall be employed.
- K. Barricades, Guards and Safety Provisions: To protect persons from injury and to avoid property damage, adequate barricades, and construction signs in accordance with Section G of the Alabama Manual on Uniform Traffic Control Devices, shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the trenched highway. Rules and regulations of the local authorities and OSHA regarding safety provisions shall be observed.
- L. Traffic and Utility Controls: Excavations for pipe laying operations shall be conducted in a manner to cause the least interruption to traffic. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire or police call boxes, or other utility controls shall be left unobstructed and accessible during the construction period.
- M. Flow of Drains and Sewers Maintained: Adequate provisions shall be made for the flow of sewers, drains and water courses encountered during construction, and the structures which may have been disturbed shall be satisfactorily restored upon completion of the work. No separate compensation will be made the Contractor for removal, replacement and restoration of existing facilities.

- N. Property Protection: Trees, fences, poles, and all other property shall be protected unless their removal is authorized; and the Contractor shall satisfactorily restore any property damaged. No separate compensation will be made the Contractor for removal of existing obstructions, including abandoned concrete slabs, within the roadway right of way.
- O. Plugging Dead Ends: Dead ends of abandoned or new lines shall be capped or plugged as shown on the plans.

3.07 PIPE LAYING

- A. Manner of Handling Pipe and Accessories into Trench: Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, and accessories shall be carefully lowered into the trench, piece by piece, by means of derrick, ropes or other suitable tools or equipment, in such manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped into the trench.
- B. Pipe Kept Clean: All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench and it shall be kept clean by approved means during and after laying.
- C. Laying the Pipe: The pipes and fittings shall be so laid in the trench that after the sewer is completed, the interior surface of the bottom thereof shall conform accurately to grade and alignment. Sewers shall be laid in the direction opposite to the direction of flow with spigot ends of pipe pointing down grade.

PVC pipe shall be installed in accordance with ASTM D-2321, latest edition. Deflection of PVC pipe after installation and backfill shall not exceed 5%.

The Contractor shall pump, bail, or otherwise remove any water which may be found or may accumulate in the trenches and shall perform all work necessary to keep them clear of water while pipe laying is in progress.

Whenever pipe laying is stopped for the night or for any other cause, the end of the pipe shall be securely closed with a stopper to prevent the entrance of water, mud, or other obstructing matter, and shall be secured in such manner as to prevent the end pipe from being dislodged by sliding or other movement of the backfilling.

After placing a length of pipe in the trench, the joint shall be held around the bottom of the spigot, so that it will enter the bell as the pipe is shoved into position.

The spigot shall be centered in the bell, the pipe shoved into position, and brought into true alignment; it shall be secured there with earth carefully tamped under and on each side. Care shall be taken to prevent dirt from entering the joint space, and joints between individual pipes shall be made watertight.

Four-inch (4") diameter tees or wyes shall be inserted in the sewer lines for connection of all existing sewer laterals. The sewer line shall be cut in a neat and workmanlike manner for insertion of tees or wyes. Tees or wyes shall be rolled 45 degrees in the vertical plane or as dictated by existing lateral elevations. All tees or wyes shall be temporarily closed by means of plugs and properly referenced for

recovery and connection of existing sewer laterals upon completion of the sewer main construction. Each sewer lateral must be located by northing, easting, and elevation. This information must be submitted to BCSS with all closeout documentation.

In every instance where pipe enters or leaves a manhole, a fitting shall be provided which shall accommodate expansion and contraction of the pipe, release strain on the pipe (caused by differential settlement between pipe and manhole) and provide a rubber ring water seal between pipe and manhole. Where indicated, fittings shall also be provided for stubouts for future connections and stubouts shall be sealed with plug fittings. Fittings shall be included in the price of the manholes.

- D. Connecting Existing Sewer Laterals: Wherever existing sewer laterals are intercepted by the excavation for the new sewer, the existing connection shall be maintained temporarily to the old sewer until the particular section of new sewer is completed and tested, then the house lateral shall be cut at the required location and connected to the new sewer through the tee or wye placed in the sewer line for that purpose. No separate compensation shall be allowed the Contractor for connecting the existing lateral to new main.

Sewer laterals shall be constructed of four-inch (4") SDR 35 PVC pipe. All tees or wyes for sewer laterals shall be SDR 35 PVC.

Where existing lateral elevations dictate the rolling of tees or wyes 45 degrees in the vertical plane, the sewer lateral pipe shall be cut and a 45-degree bend provided for vertical alignment of the new and existing sewer lateral.

The Contractor shall take particular care to keep sewer laterals clean of all dirt, mud and other obstructing matter.

No separate compensation shall be allowed the Contractor for work and materials required in maintaining temporary service of the existing sewer lateral to the old sewer line nor for handling sewage while connecting the existing lateral to the new main.

All pipe for force mains shall be marked within the right of way using a metalized tape buried between 18 and 24 inches below the ground surface. Tape shall be 3" wide minimum, Terra Tape, as manufactured by Griffolyn Company, Inc., Detectatape as manufactured by Allen Systems, Inc., or an approved equal. The pipe trench shall be backfilled to approximately 24 inches below the ground surface and then metalized tape shall be placed flat over top of pipe. Backfill shall be carefully placed to a depth of 3 inches by hand to assure that the tape is secured in place over the pipe. It is the intent of this paragraph to provide a means to locate sewer laterals using standard pipe location equipment.

3.08 EMBEDMENT OF PVC GRAVITY SEWER PIPE

- A. Embedment:

Except as modified hereinafter, embedment material for PVC gravity sewer pipe shall be either Class I, II, or III material as described in ASTM 2321. The embedment detail for PVC gravity sewer pipe on the plans has been prepared to

illustrate the meaning and limits of the terms "haunching," "foundation or bedding," and "initial backfill" as used in these specifications. The table below shall be used in determining the material required for embedment of PVC gravity sewer pipe.

EMBEDMENT FOR PVC GRAVITY SEWER PIPE

Pipe Depth	Bedding or Foundation	Haunching	Initial Backfill
16' or Less	CI, II, or III	CI, II, or III	CI, II, or III
Greater than 16'	CI, or CII	CI	CI, II, or III

In areas where the existing soil is other than as described above and is not acceptable for use as embedment material, crushed stone or reef shell as herein before specified shall be used. Separate payment will be made for crushed stone or reef shell used for foundation or bedding and haunching under the items of "Crushed Stone Foundation" and "Haunching for PVC Sewer Pipe" respectively. There will be no payment for embedment material when existing material is utilized.

In areas where the pipe is below the water table or expected to be below the water table in the future, and the foundation or bedding material is Class I material, whether existing or as installed, crushed stone or reef shell shall be used for haunching of the pipe. Separate payment will be made for crushed stone or reef shell used for haunching of the pipe under the item of "Haunching for PVC Sewer Pipe."

B. Embedment materials listed here include a number of processed materials plus the soil types listed under the USGS Soil Classification System (FHA Bulletin No. 373). These materials are grouped into five broad categories according to the suitability for this application:

- (1) Class I - Angular, 6 to 40 mm (1/4 to 1-1/2 inch), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.
- (2) Class II - Coarse sand and gravel with maximum particle size of 40 mm (1-1/2 inch), including variously graded sands and gravel containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class.
- (3) Class III - Fine sand and clayey gravel, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil types GM, GC, SM and SC are included in this class.
- (4) Class IV - Silt, silty clays, and clays including inorganic clays and silts of medium to high plasticity and liquid limits. Soil types MH, ML, CH, and CL are included in this class. These materials are not acceptable for bedding, haunching, or initial backfill.

- (5) Class V - This class includes the organic soils OL, OH, and PT as well as soils containing frozen earth, debris, rocks larger than 40 mm (1-1/2 inch) in diameter, and other foreign materials. These materials are not acceptable for bedding, haunching, or initial backfill.

3.09 BACKFILL

- A. Backfilling: Backfill material shall be free from rocks or boulders and shall be deposited in the trench simultaneously on both sides of the pipe for the full width of the trench in four-inch (4") layers to an elevation of at least 6 inches above the top of the barrels of the pipe. Material shall be dry enough to compact to the equivalent density of the surrounding earth. If too dry the backfill material shall be dampened. Backfill containing broken pavement shall not be used. Backfill shall be in four-inch (4") layers, tamped with hand tamps, to 6 inches above the top of the pipe. The remainder of the trench shall be backfilled in six-inch (6") layers and tamped with a mechanical tamper specifically manufactured for compacting backfill.
- B. Deficiency of Backfill, by Whom Supplied: Any deficiency in the quantity of material for backfilling the trenches, or for filling depressions caused by settlement, shall be supplied by the Contractor at no cost to the Owner.
- C. Backfill Under Pavement: Backfill under all existing or proposed pavement for street, driveways, sidewalks, or roadways up to the existing grade or proposed grade, whichever is lower, and to a minimum distance of ten (10) feet adjacent to existing or proposed pavement, shall be as specified elsewhere herein.

3.10 PRECAST CONCRETE MANHOLES

Precast manholes shall conform to the requirements of ASTM C-478. Type II Portland Cement along with calcareous aggregate or limestone shall also be used in the construction of the manholes in lieu of lesser corrosive resistant materials. The top section of manholes 6 feet or more in depth shall be eccentric cone sections. The top section of manholes less than 6 feet in depth shall be flat concrete slabs.

- A. Manhole bottoms shall be either cast in place concrete or integral with the lower section of riser walls as hereinafter specified.
1. Poured in place bottoms shall be a minimum of 8" thick and shall be not less than 12 inches in diameter larger than the outside of the riser section. The top of the manhole bottom shall be not less than 3 inches below the lowest pipe invert. The invert of the manhole shall be built up with cement grout as shown for brick manholes.

Special care shall be taken to assure a good seal around the manhole bottom. The joint between the bottom and walls shall be sealed on the outside with grout.
 2. Bottoms integral with side walls shall be set on a prepared bed of not less than 6 inches of crushed stone or an approved equal. The bed shall be accurately shaped to fit the manhole bottom to assure uniform bearing over the entire manhole bottom. The invert of the manhole shall be built up with cement grout as shown for brick manholes.

- B. Joints in riser and cone sections shall have rubber gaskets or an approved equal.
- C. Pipe cutouts shall be sealed with non-shrink, calcareous, grout or an approved equal after pipe stubouts are in place.
- D. Every manhole shall be fully and completely built as the work progresses and as each is reached.
- E. Manholes shall be neatly and accurately built, according to the plans, and specifications, of proper materials and in a workmanlike manner.
- F. The invert and bottom curves of all manholes shall be neatly and accurately constructed of a calcareous cement mix and so formed as to facilitate the entrance and flow of sewage over them.
- G. Steps shall be placed in manholes and shall be spaced not more than 15 inches vertically and shall be so arranged that the lowest step shall not be more than two (2) feet above the bench. The top step shall not be more than 3 inches below the manhole frame.
- H. The Contractor shall furnish and properly set in mortar to line and grade all cast iron covers and frames. Brick stacks not more than 12 inches and not less than 6 inches in total height shall be used to adjust manhole covers and frames to the proper grade where tops of manholes are to be flush with existing or proposed ground or streets or where directed. Brick stacks will not be required where tops of manholes are to be above the existing or proposed ground surface.
- I. When required, stubouts of required size shall be built into manholes to receive either present or future branch lines. Where it is not intended to construct the branch lines at once, the stubouts thus inserted must be securely closed in such a manner that future connections can be made without breaking the stubout.
- J. Where manholes intercept existing sewer mains or laterals connected to existing manholes, the Contractor shall keep the sewer main or lateral service to the existing manhole intact until the next adjacent section of new sewer is completed and approved. The laterals or mains shall then be broken and fed to the new sewer laterals or mains and the dead end of the abandoned mains or laterals plugged with an approved plug.

3.11 CONNECTIONS AT MANHOLES

Where indicated on the plans or where directed by the Engineer in the field, connections shall be neatly and accurately constructed of proper materials in a workmanlike manner, including the reconstruction of the manhole wall. Connections shall be made at the manhole bottom invert, where possible, and shall in no case be more than two (2) feet above the manhole bottom invert without a drop connection.

Where indicated on the plans or instructed in the field, drop connections shall be neatly and accurately constructed of proper materials and in a workmanlike manner, in strict accordance with the details shown on the plans. Piping for drop connections shall be PVC except where noted otherwise on the drawings.

In every instance where pipe enters or leaves manhole, a fitting shall be provided which shall accommodate expansion and contraction of the pipe, release strain on the pipe (caused by differential settlement between pipe and manhole) and provide a rubber ring water seal between pipe and manhole. Where indicated, fittings shall also be provided for stubouts for future connections, and stubouts shall be sealed with PVC plug. Fittings shall be included in the unit price for the manholes or the manhole connection, as appropriate.

All existing manholes receiving discharges from a force main shall be lined with a urethane base liner.

3.12 VACUUM TESTING MANHOLES

At the discretion of the engineer, vacuum testing of manholes will be required. Any leakage in the manhole shall be repaired by the Contractor for no additional compensation. All pipes for vacuum testing entering the manhole shall be installed at the top access point of the manhole. A vacuum of 10 inches of mercury (Hg) (5.0 psi) shall be measured for the vacuum to drop to 9 inches of mercury (Hg) (4.5 psi). Manholes will be considered to have failed the vacuum test if the time to drop 1 inch of mercury is less than the limits shown in the following table:

Depth (feet)	Manhole Diameter (inches)			
	48"	60"	72"	96"
4	10 sec	13 sec	16 sec	19 sec
8	20 sec	26 sec	32 sec	38 sec
12	30 sec	39 sec	48 sec	57 sec
16	40 sec	52 sec	64 sec	76 sec
20	50 sec	65 sec	80 sec	95 sec
+ Each 2'	+5 sec	+6.5 sec	+8 sec	+9.5 sec

A Baldwin County Sewer Service representative must be present during vacuum testing.

3.13 INFILTRATION

Leakage into the completed sewer main shall not exceed 100 gallons per mile of sewer per inch of inside diameter of the sewer per 24 hours in any section between successive manholes. The amount of leakage shall be measured by a suitable weir or other device. All equipment and labor for measuring the infiltration shall be furnished by the Contractor. If the infiltration exceeds the amount specified above, the Contractor shall make the necessary corrections to bring it within the acceptable limits. All visible leaks or points of infiltration shall be repaired even though the infiltration is below the maximum specified.

3.14 CLEAN-UP

Where these operations are on City, State, County or Private Property, the job shall be kept clean at all times. Loose dirt shall not be allowed to clog ditches or cover sidewalks. Soft clay or other undesirable material removed from the trenches shall be removed from the streets, sidewalks or ditches. The Owner reserves the right to demand that the Contractor's forces be diverted to this clean-up at any time that condition of streets, driveways, sidewalks, or private property warrants such diversion. Such diversion of Contractor's forces will not entitle the Contractor to any extension of time or additional compensation.

3.15 TESTING OF SANITARY SEWERS

- A. General: On all sanitary sewer lines, including laterals, wherever possible and practical, the Contractor shall conduct a line acceptance test. The test shall be conducted after the pipe has been backfilled and the cost of testing shall be included in other items of work. Equipment to be used in making the test shall be specifically designed for this purpose. Air tests for gravity sewers shall include the use of Cherne Air-Lock Equipment, NB Products, Inc. equipment, or approved equal. The Engineer or Baldwin County Sewer Service, LLC shall be advised at least 48 hours before tests are conducted.
- B. Procedures: A BCSS representative must be present during all required sewer testing. Sanitary sewer lines shall be tested by the following methods:
 - 1. Gravity Sanitary Sewer Lines
 - a. All PVC sewer lines shall be tested for initial diametric deflection not less than 30 days following installation and backfill using a "GO-NO-GO" type mandrel or other approved method. Pipe found to be deflected more than 5% shall be replaced at the Contractor's expense. The mandrel test shall take place after the sewer main has been backfilled to the final grade elevation 30 days after installation or at the Engineer discretion.
 - b. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold this pressure without bracing and without movement of the plugs out of the pipe.
 - c. After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The test time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any groundwater that may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

<u>Pipe Dia. in Inches</u>	<u>Minutes</u>
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5

- d. In areas where groundwater is known to exist, the Contractor shall install a one-half inch (1/2") diameter capped pipe nipple, approximately ten (10) inches long, through a manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The hose shall be held vertically and measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is eleven (11) feet, then the added pressure will be five (5) psig. The allowable drop of one (1) pound and the timing remain the same.) Other methods for determining groundwater level may be used if approved in advance and if results are expected to be accurate in determining the groundwater level.
- e. Should the line fail the pressure test, the Contractor shall, at his expense, determine the source of leakage and make repairs as necessary to eliminate leakage. Air testing shall be in addition to infiltration tests specified elsewhere herein.
- f. No direct payment will be made for air testing of sewers. Payment for this item shall be included in the unit price bid for the sewer pipe installed.

3.16 INTERNAL VIDEO INSPECTION

- A. General: The Contractor shall furnish a mobile television inspection studio, all television equipment including a pan and tilt color camera and other necessary types of equipment, and all materials, electricity, labor, technicians, etc., as may be needed to perform the closed circuit television inspection of sanitary sewers for the purpose of documenting materials of construction, defects, lateral locations, manhole locations and other physical features of the sewer main. The video inspections, software/equipment, and operator shall be certified in accordance with the latest standards of the National Association of Sewer Service Companies (NASSCO's) Pipeline Assessment and Certification Program

(PACP).

- B. Inspection Procedures: The sewer shall be fully cleaned before inspection begins. The internal Inspection shall be performed in one section of sewer at a time between adjacent manholes. The inspection shall be performed by transporting the camera with a mechanical transport device through the section of the sewer along the axis of the pipe. The camera shall travel in the direction of flow or from the upstream manhole to the downstream manhole unless an obstruction in the pipe requires traveling from the downstream manhole to the upstream manhole (reverse setup). In accordance with the PACP standard, the speed of the camera shall be no more than 30 feet/minute. At all lateral connections and defects, the camera shall stop, pan, and tilt such that the lateral connection or defect is seen from a perpendicular field of view, and an identification code and description shall be recorded during the video inspection in accordance with PACP standards. Each lateral and defect shall be extensively filmed and described.

The distances measured to defects and laterals shall be referenced or “zeroed” to the center of the manhole at which recording is started and in all subsequent manholes if multiple segments are videoed at the same time. The location within the pipe shall be shown in 0.1-foot increments on the video recording and shall have an accuracy of +/- one (1) foot. Re-videoing of the pipe at no additional cost will be required if the specified accuracy is not met.

- C. Inspection Report: The report shall be provided in PACP Exchange Format. A copy of the report, typed and bound, shall be delivered to BCSS or its representative. There shall be no discrepancies between the video and its report.
- D. Video Inspection Recordings: The purpose of the video recordings shall be to supply a continuous visual record of the inspection. The video shall be created and documented in accordance with NASSCO’s PACP standards. The data shall be provided to the BCSS or its representative via hard drive or DVD and in PACP exchange format.
- E. Major Defect: Prior to final street surfacing, it is the responsibility of the Contractor to provide BCSS or its representative with a quality control construction video that clearly shows work that is free of defects and completed in accordance with plans and specifications. The Contractor shall notify BCSS or its representative immediately upon discovering a major defect in the sanitary sewer main that will require a repair or some other corrective action to correct the defect.
- F. Sag Proofing Sewer Mains: Once the pipe is cleaned and flooded, the camera will travel forward through the pipe with a tow string and sag gage attached. The camera videos the gage as it travels slowly through a sag and then stops to allow the water to calm. If the sag gage is seen above the water surface then the sag is acceptable. If it is submerged then the sag is rejected and must be repaired. The sag gage is a stainless round stock turned to the appropriate diameter (see table below). The gage diameter must be stamped on the gage.

Allowable Sag Table

PIPE DIAMETER (NCHES)	MIN. GRADE (%)	MAXIMUM DEPTH (INCHES)		MAXIMUM SAG LENGTH (FT)	MINIMUM ALLOWABLE DISTANCE BETWEEN SAGS WITH 10% OR GREATER IN DEPTH (FT)
		EQUAL OR LESS THAN MIN. GRADE	GREATER THAN MIN. GRADE		
8	0.400	1.2	1.5	6 FT	36 FT
10	0.280	1.5	1.65	6 FT	36 FT
12	0.220	1.65	1.8	9 FT	54 FT
15	0.150	2.25	2.25	9 FT	54 FT
16	0.140	2.25	2.4	9 FT	54 FT
18	0.120	2.25	2.7	9 FT	72 FT
21	0.100	2.25	3.0	9 FT	72 FT
24	0.080	2.25	3.6	9 FT	72 FT

3.17 USE OF CHEMICALS

All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with manufacturer's instructions.

3.18 PERMITS, CERTIFICATES, LAWS AND ORDINANCES

The Contractor shall, at his own expense, procure all permits, certificates and licenses required of him by law for the execution of his work. He shall comply with all Federal, State, or Local laws, ordinances, or rules and regulations relating to the performance of the work.

3.19 UNDERGROUND UTILITIES

The plans show certain features of topography, and certain underground utilities, but they do not purport to show in complete detail all such lines or obstructions. Such topography and notes on the plans were inserted from records available and are for the Contractor's convenience only, and shall not be used as the basis for claims of extra compensation. Whenever necessary to determine the location of existing pipes, valves, or other underground structures, the Contractor shall examine all available records and shall make all explorations and excavations for such purpose. Any damage to existing facilities resulting from the Contractor's operations shall be immediately repaired by the Contractor at no cost to the Owner.

3.20 ABANDONED SEWER MAINS AND APPURTENANCES

The Owner shall retain ownership of all salvageable material removed from the project. The Contractor shall neatly store these materials at locations designated by the Engineer. The cost of removing and storing these materials as directed will be borne by the

Contractor with no direct payment. Any material deemed unsalvageable by the Engineer or that is not wanted by the Owner shall become the property of the Contractor and removed from the work site for no additional compensation.

3.21 PUMPING AND BYPASSING

No sewage or solids shall be dumped, bypassed or allowed to overflow into streets, streams, ditches, catch basins or storm drains nor will it be allowed to "back up" upstream to such an extent that homes, businesses, etc. along the sewer are flooded.

When pumping/bypassing is required, the Contractor shall supply the necessary pumps, conduits and other equipment to divert the flow of sewage around the manhole or pumping station at which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of a rainstorm. The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. If pumping is required on a 24-hour basis, all engines shall be equipped in a manner to keep the pump noise at a minimum.

Where pump discharge lines cross streets or alleys, they shall be covered with wooden or metal ramps designed and installed in such manner that they do not unreasonably impair vehicular traffic traveling said streets and alleys. All "pumping" or "bypassing" work, the arrangement or layout of the pumping and bypassing facilities, and the manholes and sewer lines to be utilized in such work must be approved by the Owner's representative prior to the time said "pumping" and "bypassing" work is started.

Whenever possible, the Contractor and the Owner's representative shall discuss and resolve the use of an arrangement of any "pumping" and "bypassing" facilities well in advance of the time of the need for such work and facilities is anticipated. The Contractor shall inspect the various sewer lines to determine for himself the quantity and depth of sewage flow in said lines, and shall determine therefrom the size of and the number of pumps and related pumping facilities will need to adequately perform the "pumping" and "bypassing" work. No direct payment will be made for pumping and bypassing.

3.22 CONCRETE

The minimum compressive strength required at 28 days is 3,000 pounds per square inch. Field specimens and laboratory tests shall be made in accordance with the standards of the American Society of Testing Materials. The minimum amount of water shall be used to produce a workable mix and shall not exceed six U.S. gallons per sack of cement. Slump shall range between two and five inches.

3.23 BRICK

Brick shall be hard-burned common brick meeting ASTM Specification No. C32, Grade MS. Brick shall be nominal 2" x 4" x 8" size.

3.24 MORTAR FOR SEWER STRUCTURES

Mortar for masonry in sewer structures shall be a 1:3 Portland Cement sand mix, provided that hydrated lime or mortar mix may be substituted for, not to exceed 10% by weight of the cement.

3.25 RUNNING BOARDS, SADDLE PILES AND MATS

Running boards, saddle piles and mats shall be two inch pine, which has been pressure treated with pentachlorophenol, C.Z.C. or other suitable preservative to resist decay.

3.26 GRAVEL, SLAG OR CRUSHED STONE

Gravel, slag or crushed stone shall be screened, washed and shall be 100% retained by a 1-1/4" screen. 100% shall pass a one inch (1") opening and shall be uniformly graded from maximum size to minimum size. Foreign matter shall not exceed 3% by weight when dry.

3.27 EROSION AND PROPERTY CONTROL

Any existing sod or grass removed shall be replaced with new sod of the same type.

- A. Flow of Drains and Sewer Maintained: Adequate provisions shall be made for the flow of sewers, drains, and water courses encountered during construction and the lines and structures which may have been disturbed shall be immediately restored to their original condition at the expense of the Contractor.
- B. Property Protection: Trees, grass, fences, signboards, poles and all other property shall be protected unless their removal is authorized. Any property damage shall be satisfactorily restored by the Contractor at the expense of the Contractor.
- C. Erosion The Contractor shall at all times take necessary precautions to prevent erosion or transportation of soil due to natural or induced water flows. Spoil banks and soil stockpiles shall be contained to prevent transportation of soil by run-off waters.

1. Topsoil:

As indicated on the plans or specifically required in the specifications, the final top surface (depth as specified) of soil within the specific area shall be a good quality topsoil which shall be material obtained from the striping operation and whatever additional topsoil required at the Contractor's cost from an off-site source. Topsoil shall be workable, friable, loamy soil free from hard lumps, stiff clay, gravel, noxious weeds, brush and other deleterious materials. Lime shall be added to reduce the possibility of odor. Topsoil shall be placed in all areas disturbed by construction, prior to grassing. No direct payment will be made for topsoil unless specifically noted otherwise.

- a. Grading: The Contractor shall perform grading of every description regardless of the character of material encountered, within the limits and to the lines and grade shown on the plans. Slight changes in grades shown on the plans may be required to allow for final dressing and drainage as the work progresses. Sufficient topsoil shall be stockpiled for final dressing.
- b. Stripping: Stripping shall consist of the removal of a minimum of four inches of grass and topsoil from within the limits of the new construction as shown on the plans. Topsoil obtained from the

stripping operation that meets or exceeds topsoil requirements of this section shall be stockpiled on the site in areas approved by the Owner. If any of the stripped material is not suitable for use as topsoil or embankment material, the Contractor at no cost to the Owner shall dispose of it away from the construction site.

2. Grassing and Mulching:

The trench lines and other areas disturbed by construction of sewer lines shall be grassed and mulched as hereinafter specified where indicated on the plans or where directed. These items are to be considered as special erosion control measures to be utilized only where specifically required and payment will be made only when these items are shown on the proposal or where Engineer authorization is granted. In all other areas, the provisions of paragraph entitled "Erosion and Property Control" of this section shall apply with respect to erosion control.

- a. General: After pipe trenches have been backfilled, the area to be grassed shall be graded to the final grade and roots, stumps, or other materials which might be harmful to grass growth shall be removed and disposed of. Care shall be taken to spread topsoil over the entire area to be grassed to the extent that topsoil along and adjacent to the trench lines is available.
- b. Fertilizer: After the surface has been prepared for grassing and before any grass or seeds are planted, the soil shall be loosened by harrowing or other approved methods, and the areas specified to be grassed shall be fertilized at a uniform rate of 1,500 pounds per acre with a standard commercial 8:8:8 fertilizer and 3,000 pounds of agricultural lime per acre.
- c. Seeding: The areas to be grassed shall be seeded with good sound seed in the following minimum quantities per acre:

Kentucky 31 Fescue 34 pounds
Common Bermuda 10 pounds
White Dutch Clover 10 pounds

In some areas, it may be necessary to vary the concentrations of various seed to suit local conditions and the Owner reserves the right to change proportions of the various seed so long as the total amount of seed does not exceed 74 pounds per acre at no change in contract price.

Seed shall be broadcast with hand operated equipment. When broadcast, seed shall be sown over the areas and raked or dragged and covered to the desired depth. Hydro seeding may, at the Contractor's option, be used in lieu of the above.

Unless specifically noted otherwise, Pensacola Bahia shall not be used.

- d. Mulching: In areas directed by the Owner, the surface of sprigged

and overseeded slopes of the roadway or embankments shall be protected by the application of a mulch. The mulch shall be spread uniformly in a continuous blanket by hand or by suitable approved equipment, at a rate of two tons to the acre. Mulching material which, in the opinion of the Engineer, is too coarse or too short for proper securing in the surface soil will be rejected. Mulching shall be started at the windward side of relatively flat areas or at the upper part of a steep slope and continued uniformly over the entire area. The mulch material shall be anchored to the soil by spraying a light coating of emulsified asphalt over the straw or hay after these materials have been placed. The asphalt shall be applied by hand sprayers attached by hoses to an asphalt spreader or other approved methods. The asphalt adhesive shall be applied to the mulch at a rate of 150 gallons of undiluted (straight emulsion) asphalt per ton of straw or hay (300 gallons per acre). If the straight emulsion is further diluted with water in the ratio of 60 (straight emulsion) to 40 (water), the application rate shall be 250 gallons of asphalt emulsion per ton of straw or hay (500 gallons per acre). This will secure the mulch on the ground to form a soil binding mulch and prevent loss or bunching by wind or water.

- e. Maintenance: the Contractor shall maintain all grassed areas until acceptance of the entire contract and for a period of three months thereafter. Areas upon which an established stand of grass is not obtained, the Contractor shall re-seed and re-mulch as hereinafter specified. A satisfactory stand of grass is defined as a cover of living grass in which gaps larger than 12 inches do not occur at the time of acceptance. Maintenance shall consist of watering, preserving, protecting, replacing dead grass, filling washes and generally maintaining the area until final acceptance.

If the grassing operation is accomplished after the month of August or before the month of March, in addition to the seeding as outlined above, the entire grassed areas shall also be over seeded with Italian Rye Grass seed at the uniform rate of 40 pounds per acre at no additional cost to the Owner.

- f. Asphaltic Adhesive: Asphalt shall be a bituminous soil cover suitable for mulching of seeded areas and shall contain no petroleum solvents or other diluents which would be toxic to plant growth. It shall be a homogenous emulsification of especially refined petroleum asphalt suitable for spray application with or without dilution with water. Laykoid Soil Cover, manufactured by American Bitumuls and Asphalt Company, or other commercial types of asphalt specifically designed for mulching of seeded areas for erosion protection against rain or wind, will be acceptable. Cost of this item shall be included in unit price bid for grassing and mulching for erosion control.

- A. General: All paved streets and other paved areas cut by these operations shall be repaved in a workmanlike manner as shown or specified. All work shall be performed in accordance with the Alabama State Highway Department's current standard specifications. Prior to excavation in paved street or other paved areas, the pavement shall be cut along straight and perpendicular lines parallel to the centerline of the pipe. Upon completion of the pipe laying, backfill shall be placed as required by these specifications. Immediately prior to repaving, jagged edges shall be squared and cut to a string line so that the pavement replacement will present a neat appearance. Centerline strips or other pavement markings which existed prior to the start of construction shall be replaced. No separate payment will be made for striping or marking.

The term "Pavement" shall be construed to mean either concrete, bituminous, cobblestones, or brick placed as wearing surface in streets, driveways, or sidewalks, or placed as slope protection for ditches or drains.

- B. Removing and Replacing Bituminous Base Course: Pipe trenches at paved surface crossings shall be backfilled with select or other stable material and compacted at near optimum moisture content to a minimum density of 95% of AASHTO T-99 placed evenly on each side of the pipe to the top of the subgrade elevation. A crushed aggregate base course, twelve (12) inches minimum compacted thickness and in accordance with Section 301 of the State of Alabama Highway Department Specifications, latest edition, shall then be constructed. For bituminous and concrete pavement replacement for street crossings, compaction tests shall be performed by a certified testing lab at two (2) foot increments vertically and at sufficient intervals along the trench to verify that density requirements have been achieved. Copies of certified lab reports shall be submitted to the Engineer, verifying that the backfill and base material meet the requirements of the contract specifications. Immediately following the completion of the required backfill and crushed aggregate base course trench construction, the top of two (2) inches of the trench shall then be filled with a Bituminous Wearing Surface 1" Max. aggregate size ESAL range A/B, flush with the road surface and continuously maintained for a period of one (1) to six (6) months, as directed by the Engineer.
- C. Bituminous Wearing Surface: The following procedure shall then be followed at the completion of the maintenance period for the Bituminous Base Course, as directed by the Engineer. Jagged edges shall be squared and cut to a neat line with an appropriate saw. The edges of the pavement shall be cut along straight lines parallel to the center of the pavement cut.

Upon completion of the repaired backfill and base course trench construction, a tack coat using SS1 or SS1h emulsified asphalt shall then be applied at a rate of 0.05 gallons per square yard to the full trench width. The bituminous flexible Pavement Wearing Layer, bituminous wearing surface 1" max. aggregate size ESAL range A/B, shall then be constructed at two hundred and twenty (220) pounds per square yard. It is intended for sanitary sewer mains in streets to be constructed in one lane and therefore requiring resurfacing of only one half of the existing street extending from the nearest edge to the center line. Care shall be taken to assure a smooth transition at each edge of pavement flush with the road surface at roadway crossing and at all other transition locations, as shown in the plan details.

After resurfacing, the Contractor shall warranty the pavement for one (1) year.

Any pavement failure that occurs during this period shall be replaced at the Contractor's expense, including removing and replacing subgrade material, if necessary. Copies of certified lab reports verifying that the construction materials used meet the project specifications shall be submitted to the Engineer.

3.29 EROSION CONTROL NETTING

Erosion control netting shall be utilized in locations where specifically required by the engineer and installed in accordance with the manufacturers' recommendation using ¾ inch x 2 ½ inch x 12 inch wedge shaped wooden stakes and/or staples. The netting material shall be Enkamat 7220 or engineer approved equal.

A. Construction Requirements

All surfaces to be protected shall be graded, fertilized, limed, and finished so as to be stable and firm.

Synthetic mat used as a ditch liner shall be applied with the length of roll laid parallel to the flow of the water. Where more than one width is required, a multi-width welded mat shall be supplied in multiples of 3 feet. All lap joints and upslope edges shall be staked at intervals of 3 feet or less. Where three-wide mat is required, lap joints to be limited to one every nine feet of width.

All wood stakes shall be driven to within 2 inches of the ground surface.

An anchor slot shall be placed at the upslope and downslope ends of the mat placement. At least 12 inches of the end of the mat shall be buried vertically in a slot dug in the soil. The mat shall be secured in the anchor slot by staples or stakes at intervals of 3 feet or less prior to burying, except when the ditch is located above the synthetic liner, in which case no stakes or staples shall be used in the anchor slot unless 6 inches separation is maintained between the point of the installed stake or staple, and the synthetic liner. The soil shall be firmly tamped against the mat in the slot.

Successive lengths of mat shall be overlapped at least 3 feet, with the upstream length on top. Stake or staple the overlap in 3 places evenly spaced across the end of each of the overlapping lengths and in 3 places across the width of the center of overlap area. Check slots shall be spaced so that a check slot occurs within each 20 feet. Stake or staple the mat in the check slot at each edge overlap and in the center of the mat, except when the ditch is located above the synthetic liner, in which case no stakes or staples shall be used in the check slot, unless 6 inches separation is maintained between the point of the installed stake or staple and the synthetic liner. Beginning and terminal ends to be staked in accordance with installation manual.

Upslope edges of mat used as ditch lining shall terminate on 4-inch wide horizontal shelves running parallel to the axis of the ditch for the full length of the ditch. Edges of the mat shall be staked at 3-foot intervals, backfilled with soil, and tamped to original slope.

After the mat has been placed, the area shall be evenly seeded or sodded, as specified and where shown on the plans.

Synthetic liner damaged by the contractor during mat installation shall be repaired immediately.

The Contractor shall maintain the blanket until all work on the contract has been completed and accepted. Maintenance shall consist of the repair of areas where damaged by any cause.

FORCE MAIN AND LOW PRESSURE SEWER SYSTEM

PVC PRESSURE PIPE

Pipe: All pipe shall meet the requirements of ASTM Standard D-2241. Pipe supplied with a solvent cement joint shall meet the requirements of ASTM D-2672. Pipe supplied with a gasketed joint shall meet the requirements of ASTM D-3139, and the joint gasket shall conform to the requirements of ASTM F-477.

All pipe shall meet the requirements of NSF Standard #14, "Plastic Piping Components and Related Materials," and Standard #61, "Drinking Water System Components-Health Effects". The pipe displays the "NSF-PW" listing mark signifying use in potable water applications.

Pipe shall be furnished in laying lengths of 20' (+/-). Other lengths and plain end finish may be available.

This product is manufactured green for Sanitary Sewer Force Main applications. Print legend will include "Force Main".

ASTM D-2241 Pressure Pipe

Nominal Size (Inches) (m.m.)		Standard Dimension Ratio (SDR)	Pressure Rating (PSI)	"A" Average Outside Diameter (O.D.)	Minimum Wall	Maximum O.D.
2	50	21	200	2.375	0.113	3.650
3	75	21	200	3.5	0.167	4.900
4	100	21	200	4.5	0.173	5.900
6	150	21	200	6.625	0.255	8.210
8	200	21	200	8.625	0.332	10.380
10	250	21	200	10.75	0.413	12.690
12	300	21	200	12.75	0.49	14.860

POLYETHYLENE PE 3408/3608 IPS – FORCE MAIN SEWER PIPE

Pressure rated HDPE municipal water and industrial pipe material color – Black pipe with 3 single and evenly spaced green stripes.

National Pipe & Plastics, Inc. Polyethylene PE 3408/3608 IPS. Forced main pressure pipe is manufactured in accordance with the specifications set-forth in ASTM Standard F-714. This product also meets the requirements of AWWA C906 "Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 inch (100 mm) through 63 inch (1,575 mm), for water distribution and transmission" with the exception that it is not approved for potable/drinking water applications. Black in color PE 3408/3608 water pipe is provided with 3 single and evenly spaced green

stripes. This material is manufactured from a HDPE Resin listed in PPI TR4 meeting a 1600-PSI Hydrostatic Design Basis, with a cell classification of PE345464C as defined in ASTM Standard D 3350.

PIPE DIMENSIONS

Pressure Class	Nominal Size (inches)	Metric Size (mm)	Average O.D.	Wall Thickness (minimum)	Pressure Rating @ 73 deg F (PSI)	Weight Per Ft.
PC 160 DR 11	4	100	4.5	0.409	160	2.290
	6	150	6.625	0.602	160	4.970
	8	200	8.625	0.784	160	8.420
	10	250	10.75	0.977	160	13.090
	12	300	12.75	1.159	160	18.410

3.31 INSTALLATION OF FORCE MAIN VALVES

- A. Resilient Seated Gate Valves: All valves shall be non-rising stem for underground direct burial service and shall close when operating nut is turned in clockwise rotation. Valves shall be in accordance with and meet the requirements and recommendations of AWWA C509. O-ring seals shall be provided. The valve shall be a compression resilient seated gate valve. Disc shall be SBR coated. Valve body shall be fusion-epoxy bonded inside and out. Valves shall be furnished complete with necessary gaskets, bolts, and nuts as needed for mechanical joint ends. Mechanical joints and accessories shall comply with the latest published AWWA C111.

1. Valves (12 Inches and Smaller): Each valve shall have mechanical joint bell ends, and shall be on the Baldwin County Sewer Service's list of materials and approved manufacturers. Valve shall be installed with the operating stem in the vertical position. Valve stem shall be furnished with 2 inch square water works nut.

B. Check Valves:

1. Swing check Valves 4-inches and larger shall have a cast iron or cast steel body with a bronze or stainless steel seat ring, non-corrosive shaft for attachment of weight and lever and a 300 psi hydrostatic test pressure rating. Check valves shall absolutely prevent the return of water back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be full opening, tight seating and its seat ring shall be renewable and must be securely held in place by a threaded joint; the valve disc shall be of cast iron or cast steel and shall be suspended from a noncorrosive shaft which will pass through a stuffing box. A tapped boss with plug shall be provided on the check valve bonnet for future use with a pressure gauge. All check valves shall have a Muller, with weight and lever.
2. Check valves smaller than 4-inches – See Specifications Page 44.

3. After check valves are installed and before they are backfilled, the contractor must prove the main line is tapped and the valve is turned on and is in working condition.

C. Valve Boxes:

1. All gate valve stems shall have access for operation with cast iron valve box. Screw type manufactured by Sigma VB 261 or approved equal.

D. Mechanical Joint Restraint for PVC Pipe

1. All mechanical joint fittings shall be restraint with EBAA Iron Inc. Series 2000 PV or approved equal.

3.32 ENCASEMENT PIPE

A. General: Encasement pipe shall conform to AASHTO Standards and Alabama Department of Transportation standards where placed under highways and to AREA 1-5-B where placed under railroads. Except where noted on the Plans, encasement pipe shall be installed by a dry boring method in which the casing pipe is placed simultaneously with the boring action.

The Contractor shall inspect the roadway or track directly above the Work before, during, and after the placing of the encasement for settlement. If settlement occurs, the Contractor shall, at no additional expense to the Owner, bring the roadway surface to its original grade by means approved by the State Highway Department or realign the track to its proper grade by means approved by the railway owner.

B. Material: Welded Steel Encasement Pipe shall be of the size and wall thickness shown on the Plans and shall conform to ASTM Designation A252, Grade 2 and the Alabama Department of Transportation standard specifications. The pipe shall be coated on the outside only with a coal tar primer coat followed by a single application of hot coal-tar enamel 3/32 inches thick \pm 1/32 inches. At the option of the Contractor, uncoated pipe may be used subject to approval of the State Highway Department or railway company provided the wall thickness is at least 0.063 inch greater than shown on the Plans or in the Proposal.

C. Encasement Spacers: Encasement pipe spacers and their accessories shall be used to maintain separation of the encasement pipe and the carrier pipe. The installation and spacing from center to center of encasement spacers shall be in accordance with the manufacturer's requirements. Spacers shall be stainless steel as manufactured by Maloney Pipeline Products Co., Cascade Water Works Mfg., Pipeline Seal and Insulator, Inc., or Engineer approved equal.

D. Encasement End Seals: encasement end seals shall be as manufactured by Maloney Pipeline Products Company, Pipeline Seal and Insulator, Inc., Cascade Water Works Mfg., or an Engineer approved equal. Material shall be 1/8 inch synthetic rubber, stainless steel sipper or closer, pressure molded to the rubber

and a rubber protective strip attached to the seal under the zipper. Seals shall be secured to encasement using ½ inch stainless steel “Band-It” clips or thumbscrew banding clips with a polyethylene strip placed under each clip. a telescopic fold shall be placed in the seal before banding to assure proper flexibility between the carrier pipe and the casing.

3.33 TAPPING SLEEVE

- A. The tapping sleeve shall have a body made of carbon steel per ASTM A283 C. The neck shall be carbon steel per ASTM A63.
The flange shall be carbon steel A36 and recessed to accept a tapping valve per MSS-SP60.
The flange drilling shall be per AWWA C207 class D (ANSI 150# hole pattern).
The gasket shall be NSF 61 approved. Nitrile (Buna N) compounded to resist oil, alkalies, most (aliphatic) hydrocarbon fluids, water and many chemicals. The gasket temperature rating shall be -20°F to +180°F.
The nuts and bolts shall be ¾” (5/8” in 4” and 6” nominal) high strength low alloy steel per ASTM A307 (ANSI 21.11) standards. The nuts shall be semi-finished hex head. The bolts shall be replaceable.
The tapping sleeve shall be coated with a fusion bonded Flexi-Coat epoxy per AWWA C213, coated to an average of 12-mil thickness.
A ¾” test outlet and plug shall be provided. The plug shall be ¾” carbon steel with square head and fusion bonded epoxy coating.
The tapping sleeve shall meet applicable AWWA C223 standards and be certified to NSF®/ANSI 61-G. The tapping sleeve shall be Smith-Blair, Inc. style 622 or approved equal.

3.34 MECHANICAL JOINT RESTRAINT FOR PVC PIPE

- A. All mechanical joint fittings shall be restraint with EBAA Iron Inc. Series 2000PV or approved equal.

3.35 COPPER LOCATION WIRE

- A. All sewer force mains (including service lines) shall be installed with underground 10 gauge THHN insulated traceable copper wire. The insulated copper wire shall be laid in the pipe trench 3 to 6 inches above the sewer force mains and shall be a continuous strand from valve box to valve box, wrapped two times around each valve and extended 24 inches inside each valve box to enable location devices to be attached without digging up the valve box. All wire splices shall be insulated. Following placement of the traceable wire, the trench shall be backfilled with due caution to prevent displacement or damage to wire. After insulation and backfill have been completed the contractor shall perform a detection test in the Engineer’s presence using a commercially available pipe detector furnished by the Contractor. Any undetectable wire shall be replaced by the Contractor to the satisfaction of the Engineer at no additional expense to the Owner.

3.36 AIR RELEASE VALVES

The Combination Air Valve combines an Air and Vacuum large orifice and an Automatic small orifice in a single body. The air and vacuum valve shall be A.R.I. D-025 or approved equivalent.

The valve is specially designed to operate with liquids carrying solid particles such as sewage and effluent.

The combination air valve discharges air (gases) during the filling or charging of the system, admits air to the system while it is being emptied of liquid and discharges accumulated air (gases) from the system while it is under pressure and operating.

Main Features:

- Working pressure range 0.2-10 bar.
- The valve's unique design prevents any contact between sewage and the sealing mechanism by creating an air gap at the top of the valve. This air gap is guaranteed even under extreme conditions. Those features are achieved by:
- The conical body shape designed to: maintain the maximum distance between the liquid and the Sealing Mechanism; so as to obtain minimum body length.
- Spring loaded joint between the stem and the upper float. Vibrations of the lower float will not unseal the automatic valve. Release of air will occur only after enough air accumulates.
- The valve design, Rolling Seal Mechanism: is less sensitive to pressure differentials than a direct float seal. It accomplishes this by having a comparably large orifice for a wide pressure range (up to 10 bar).
- Funnel-shaped lower body is designed to ensure that residue sewage matter will sink to the system and be carried away and will not remain in the valve.
- All inner metal parts made of stainless steel. Float made of plastic material.
- 1 ½" threaded drainage outlet enables removal of excess fluids.
- Preventing premature closing the valve discharges air at high velocity.
- Working temperature 60°.
- Maximum instantaneous working temperature 90°.

Valve Selection

- These valves are available with 2", 3" male BSP connections, or flanged, ANSI standard.
- These valves are available with body made of reinforced nylon or stainless steel SAE 316 or ductile iron.
- With a Vacuum Guarding. Out-only attachment, which only allows air intake, not allowing air discharge.
- With a Non-Slam, discharge-throttling attachment, which allows free air intake, but throttles air discharge.

Parts List and Specification

No.	Part	Material
1.	Drainage Outlet	Polypropylene
2.	Seal Plug Assembly	R.N. + E.P.D.M. + St. St.
3.	Float	Foamed Polypropylene
4.	Clamping Stem	Reinforced Nylon
5.	Body	Reinforced Nylon / St. St.
6.	Crown Nut	Stainless Steel SAE 316

7.	O-Ring	Vitun / BUNA-N
8.	Stopper	Acetal
9.	Spring	Stainless Steel SAE 316
10.	Washer	Stainless Steel SAE 316
11.	Stem	Stainless Steel SAE 316
12.	Body	R.N. / St. St./ Ductile Iron
13.	Clamp	Stainless Steel SAE 316
14.	O-Ring	BUNA-N
15.	Float	Foamed Polypropylene
16.	Tap	Brass ASTN A124
17.	Washer	Stainless Steel SAE 316
18.	Base	R.N. / St. St. / Ductile Iron

3.37 FULL CIRCLE REPAIR CLAMPS

A. The full circle repair clamp shall have an 18-8 Type 304 stainless steel band. It shall be a minimum of 15" in width (5" minimum width for the 221). The lugs shall be made of high strength ductile iron per ASTM A536 GR80-55-06 and have a fusion bonded Flexi Coat epoxy coating.

The lugs shall be attached to the band by hemming the band and sliding it into the lug slot. The slot shall be cast into the lug base. The lug shall have a friction fit with the band, preventing it from sliding off, yet allowing for easy removal and reattachment in case of installing the clamp in restricted spaces.

The gasket shall be made of Nitrile (Buna N) specially compounded to resist water, oils, acids, alkalies, most (aliphatic) hydrocarbon fluids, and many other chemicals. The temperature range of the gasket shall be -20°F thru +180°F. The gasket must have a bridge plate that helps the end of the clamp band to seal across the gap. The bridge plate shall be made of quarter-hard 304 stainless steel. It shall be recessed and bonded into the gasket. The gasket shall have a gridded pattern. The gasket shall be tapered on the ends and overlap for range capability.

All bolts shall be at least 5/8" x 6" high strength low alloy per ANSI A21.11 and B18.10. At least one 5/8" x 6 7/8" bolt with a taller nut shall be furnished to help facilitate installation of clamps up thru 4.50" O.D. Heavy semi-finished nuts meeting ASTM A563 shall be provided with the bolts. Multiband clamps shall have all closed lugs except for one set of open and closed lugs to allow for easy opening and installation of the clamp. (Optional – stainless steel type 304 bolts and nuts. The nuts shall be fluoropolymer coated to prevent galling.)

The clamp shall be a Smith-Blair, Inc. 226 full circle clamp or approved equal.

3.38 SANITARY SEWER FORCE MAINS TESTING REQUIREMENTS

A BCSS representative shall be notified at least 24 hours prior to the testing. The representative must be present when the test begins and ends. All sanitary sewer force mains shall be tested as follows:

After the pipe has been laid and partially backfilled, all pipe or any valved section shall, unless otherwise specified, be subjected to a minimum hydrostatic pressure of

100 psi. The pressure test shall be for at least two hours. Before testing, all air shall be expelled from the line. The Contractor shall make all necessary taps to expel the air and then plug all taps watertight. The Contractor shall use an approved recording pressure gauge with 12" chart.

The Contractor shall provide approved and suitable means for determining the quantity of water lost by leakage. No pipe installation will be accepted until or unless the leakage (evaluated on a pressure basis of 100 psi) is less than 25 U.S. gallons per 24 hours per mile of pipe per inch nominal diameter of pipe. The Contractor shall repair any observed leaks.

All service taps shall be inspected prior to backfilling.

PRE-SET LOW PRESSURE SEWER SERVICE SPECIFICATIONS

All new low pressure sewer service installations shall consist of the following referenced materials:

1. 1 ½" low pressure sewer pre-set service.
2. Service saddle – Smith-Blair Ductile iron service saddle No. 313.
3. Corporation stop – A.Y. McDonald 73149B, male iron pipe x female iron pipe.
4. Brass Nipple – Merit Brass taper pipe threads (NPT).
5. Swing check valve – A.Y. McDonald 72051T threaded ends.
6. Coupling – A.Y. McDonald 74753Q male iron pipe x CB compression.
7. Sewer tubing – PE 3608 CTS – Sewer tubing solid green in color.
8. Curb Stop – A.Y. McDonald ball type CB compression x CB compression 76100WQ with lockwing.
9. The pressure sewer service curb-stop shall be enclosed with a green plastic meter box.
10. All compression connections on CTS tubing to be installed using 1 ½" stainless steel stiffener insert A.Y. McDonald Model 6133T.

NOTE: See low pressure sewer service detail.

GENERAL
SEWAGE PUMPING STATION REQUIREMENTS

4.01 SCOPE:

These Specifications form a part of the Contract Documents and shall govern the construction of sewage pumping stations. The Work covered by this Section includes the furnishings of all labor, equipment, and materials, and performing all operations in connection with the construction and installation of Sewage Pumping Stations complete pumps, piping, wet well, electrical work and all necessary auxiliary equipment. The station shall be complete and in strict accordance with this section of the specifications and the applicable plans, the standard practices and ordinances of the UTILITY and subject to the terms and conditions of the Contract.

4.02 MATERIALS:

Materials of this Section shall be as specified herein.

4.03 INTENT OF PLANS AND SPECIFICATIONS:

The intent of the plans and specifications associated with this Section is to provide a complete sewage pumping station which will function as intended and is ready for operation.

It shall be the responsibility of the Contractor as a part of the Work through careful quality control and coordination with the Engineer to avoid all conflicts occurring during construction such as available space, routing, mismatched or otherwise incompatible component selection, incomplete systems, substitutions, etc.

Where inter-system components, devices, adapters, etc., are not specified or noted in the design, but required to complete the system, it shall be the responsibility of the Contractor to provide such items and materials as part of the Work.

Unless otherwise noted, items specified herein by manufacturer or trade name shall be used as a guide to quality and inherent features.

Special drawings and Specifications shall be submitted by the contractor for the Engineer's evaluation covering all equipment, controls, material, and construction procedures.

The actual field installation shall reflect only that material and equipment submitted and approved by the Engineer. Any work performed without an approved submittal and considered not acceptable by the Engineer shall be removed and reworked at the Contractor's expense.

4.04 SUBMITTAL AND TESTS:

Prior to installation of any material or equipment, the Contractor shall submit for approval of the Engineer, five sets of required submittal material indicating item identification, manufacturer, type, size, ratings, and other descriptive information

required for adequate evaluation. Wiring diagrams shall be submitted where item function description necessitates, and as required by the Engineer. Submittals shall be conspicuously marked to denote departures from the design references shown on the plans or specified. Incomplete submittals will not be evaluated.

Submittals shall bear a stamp or specific written indication that the Contractor has satisfied his responsibilities under the Contract with respect to the Contractor's review of the submission.

Omissions and/or design revisions made in submittals shall not relieve the Contractor from the responsibility of providing the omitted item or required material as a part of this Work. Approval by the Engineer shall not constitute acceptance of an erroneous or incomplete system submittal.

Material submittals shall be manufacturer's catalog sheets or similar published data marked to denote only the item or items covered by the submittal. Materials of unique production shall have special submittal attention to give complete identification of the materials being proposed.

- A. Equipment submittals shall present the equipment for evaluation as a unit piece including all component parts by manufacturer's designation. Submittals shall be marked to denote only the equipment being proposed and shall be complete including electrical, physical, and operational data. Additional supporting data shall be provided where necessary.
- B. Fabrications, assemblies, and special productions shall have submittals of unique preparation to present the finished item completely identified. Such shop drawings shall include all material components and assembly work.
- C. Systems composed of multiple parts or subsystems shall have submittals to denote the system as a completed composite. All component parts and subsystems shall be identified.
- D. Documentation of the finished installation shall be made as a part of final acceptance and shall include corrected submittals, operation and maintenance publications, and other data to accurately define the final field installation.
- E. Test Instructions and Reports:

The following listed items shall be required in addition to other special requirements within these Specifications.

- 1. Written conductor insulation resistance test.
- 2. Written ground rod resistance test.
- 3. Local public electrical inspector's certificate.
- 4. Operational demonstration test.

4.05 SITE WORK:

In general, clearing shall consist of the removal and disposal of all undergrowth, brush, logs, trash and other material. All materials cleared from the site shall be disposed of off site by the Contractor. It is the intent that the entire area within the limits of the sewage pumping stations as shown on the plans shall be cleared and graded for proper storm drainage and grassed in accordance with the specifications contained herein.

4.06 EXCAVATION FOR PIPES AND STRUCTURES:

- A. General: The Contractor shall perform excavation of every description regardless of the nature of the materials. Trenches or foundations for pipes or structures shall be excavated to the lines, grades, and elevations shown on the plans. Trench and structure excavations shall be of sufficient size to permit the placing of pipes, structures, and forms, as necessary to perform work.
- B. Overcuts: If, at any point in excavating for structures, material is excavated beyond the neat lines upon or against which concrete is to be placed, the overcut shall be filled with reef shell, crushed slag or crushed stone fill properly compacted, or with concrete, as directed by the Engineer. The proposed elevations and positions for the different structures are shown on the plans. However, the Engineer reserves the rights to make such modifications as in his opinion are necessary to carry out the intent of the plans and specifications. No payment will be made for overcuts or reef shell, crushed slag or crushed stone fill in overcuts. Reef shell, crushed slag or crushed stone shall be specified in the Board's Standard Specifications.
- C. Dewatering: The Contractor shall remove any water which may be found or may accumulate in the trenches and shall perform all work necessary to keep them clear of water while foundations are being laid, masonry is being constructed, or pipe laying is in progress. Such removal shall be accomplished by means of a well point system or other approved means. Comprehensive plans for dewatering operations, if used, shall be submitted prior to installation. No payment will be made for dewatering.

4.07 CONCRETE:

The minimum compressive strength required at 28 days is 3,000 pounds per square inch. Field specimens and laboratory tests shall be made in accordance with the standards of the American Society of Testing Materials. The minimum amount of water shall be used to produce a workable mix and shall also be in accordance with those specified for manhole structures.

4.08 WET WELL/VALVE BOX GENERAL:

All duplex pump stations including grinder and non-clog pumps shall include a prepiped fiberglass wet well including all necessary components. All duplex non-clog stations shall include an external fiberglass valve box with integral pump out connection. All duplex grinder stations shall include stainless steel valves arranged in the wet well to allow ease of maintenance and shall not require an external valve box.

4.09 WET WELL/VALVE BOX FIBERGLASS CONSTRUCTION:

The resins used shall be commercial grade polyester and shall be evaluated as a laminate by test or determined by previous service to be acceptable for the intended environment.

The reinforcing material shall be a commercial grade of glass fiber (filament wound) having a coupling agent which will provide a suitable bond between the glass reinforcement material and resin.

The FRP laminate wall thickness shall vary with the wet well height to provide the aggregate strength necessary to meet the tensile and flexural physical properties requirements. The wet well/valve box FRP wall laminate must be designed to withstand wall collapse or bucking based on a hydrostatic pressure of 62.4 pounds per square foot; a saturated soil weight of 120 pounds per cubic foot; a soil modulus of 700 pounds per square foot; and the pipe stiffness values as specified in ASTM D3753. The wet well/valve box FRP laminate must be constructed to withstand or exceed two times the assumed loading on any depth of the wet well/valve box.

The finished FRP laminate will have a Barcol hardness of at least 90% of the resin manufacturer's specified hardness for the fully cured resin. The Barcol hardness shall be the same for both interior and exterior surfaces.

The wet well/valve box flange shall have an outside diameter at least 4.0 inches greater than the inside diameter of the wet well/valve box. A six hole pattern shall accommodate the mounting of a cover with at least 0.25 inches in diameter 300 series stainless steel fasteners. Non-corroding stainless steel threaded inserts shall be full encapsulated with non-continuous or chopped-strand glass fiber reinforcement. The inserts shall have an offset tab to prevent stripping or spinning out when removing and reinserting cover fasteners.

4.10 WETWELL/VALVE BOX COVER

The basin cover shall be Model BPS as manufactured by U.S.F. Fabrication, Inc., Hialeah, Florida, or equal with the size being specified on the plans. Cover plate and door leaf shall be 1/4 inch thick aluminum diamond plate reinforced for a 300 p.s.f. live load. The cover shall have six (6) 5/8 inch diameter holes equally spaced around the perimeter to bolt it down to the structure for fiberglass wells or pour in place for concrete wells. The access door shall be equipped with a flush drop handle that does not protrude above the cover, and a stainless steel hold open arm with red vinyl grip that automatically locks the cover in the 90 degree open position. The door shall have stainless steel hinges and stainless steel tamper resistant bolts/locknuts. A staple for a padlock shall be supplied for security. All stainless steel components shall be type 316 alloy. Installation shall be in accordance with the manufacturer's attached instructions. The door shall be manufactured and assembled in the United States. Venting for both wetwell and valvebox shall be provided through pvc constructed mushroom vents and through bolted with stainless steel fasteners to each cover. Painted steel vents will not be accepted. Manufacturer shall guarantee the door against defects in materials and workmanship for a period of ten (10) years.

4.11 NON-CLOG PUMPS

There shall be supplied as shown by the plans two (2) Wilo submersible, non-clogging pumping unit(s) specifically designed to pump slurries of grit, debris and organic solids without clogging.

PUMP CONSTRUCTION

A. GENERAL

The sewage pumping units shall be vertical, non-clogging, centrifugal sewage pumps with bottom inlet and side discharge. The pumps shall be direct driven by integral squirrel cage, electric induction motors. Each pump shall include motor, bearings, quick removal system, anchor bolts and all accessories specified herein.

B. VOLUTE

1. The volute shall be constructed of ASTM A48 minimum Class 30B or higher cast iron (GG20) capable of prolonged resistance to raw sewage.
2. Suction and discharge flanges shall be 125# and meet ANSI standard B16.1.
3. All nuts, bolts, washers, and other fastening devices supplied with the pumps shall be stainless steel.
4. All mating surfaces requiring a watertight seal shall be machined and fitted with FKM, FPM, (Viton®) O-rings. Paper gaskets are not acceptable.

C. IMPELLER

1. Pump impellers shall be of the solids handling single/two/three vane non-clog type. The impeller vane shall be smooth, finished throughout, and shall be free from sharp edges.
2. Pump impellers shall be manufactured from ASTM A48 Class 30B or higher cast iron (GG20).
3. Impellers shall be key driven and securely held to the shaft by a streamlined impeller washer and bolt assembly specifically designed to reduce friction in the suction eye of the impeller. The arrangement shall be such that the impeller cannot unscrew or be loosened by torque from either forward or reverse rotation. Designs based on threaded connection between pump shaft and impeller will not be considered.
4. The impeller shall be capable of passing a 3-inch solid non-deformable sphere through the bottom inlet and out between the two shrouds. Designs which cannot pass a sphere through the impeller or rely on deforming, cutting or chopping solid materials shall not be acceptable.

D. WEAR RINGS

1. The impeller shall be provided with an AISI 329 (1.4462) duplex stainless steel wear ring which is drive fitted to the suction eye of the impeller. The impeller wear ring shall be hardened to a Brinell hardness of 200-250.
2. The casing shall be provided with an AISI 304 (1.4308) stainless steel wear ring which is drive fitted to the bottom suction inlet. The volute wear ring shall be hardened to a Brinell

hardness of 275-325.

MOTORS

A. SUBMERSIBLE MOTORS

1. Each pump shall be furnished with a squirrel cage, induction motor enclosed in a watertight housing suitable for use and compatible with all variable frequency drive systems.
2. The motors shall be air-filled or oil-filled (or optionally oil-filled cooling system with integral heat exchanger for exposed motor operation) and constructed with moisture resistant NEMA Class H insulation and Class H slot liners and constructed to NEMA B design standards. The copper wound stator shall be dipped in epoxy enamel and hardened to withstand a temperature of 180 degrees Centigrade as defined in NEMA Standard MG-1. Each winding phase or layer shall be laced with Class H glass lined paper. The use of cable ties to restrain windings shall not be allowed. The rotor shall be statically and dynamically balanced after fabrication. The rotor shall utilize aluminum amortisseur bars and short circuit rings. The constructed motor shall be certified for continuous duty with a service factor of 1.15 and shall be non-overloading over the entire range of the impeller.
3. Motors shall be capable of sustaining 15 starts per hour (unlimited starts with VFD) at a minimum ambient temperature of 40°C.
4. Motors shall be capable of uninterrupted operation with a voltage drop of 10%.
5. Thermal switches shall be furnished to monitor stator temperatures. The stator shall be equipped with two (2) thermal switches. Thermal switches shall automatically de-energize the motor when its temperature exceeds a preset limit as recommended by the manufacturer.
6. The pump manufacturer's nameplates shall be engraved, laser etched or stamped on stainless steel and fastened to the motor casing.
7. Motors 15hp and below shall be 208/120 volt 3 phase 5 wire. Motors 20hp and larger shall be 480/277 volt 3 phase 4 wire. Single phase power is subject to engineer approval.

B. SHAFTS

1. Pump shafts shall be AISI 420 (1.4021) stainless steel. Carbon steel shafts or shafts with sleeves of any type are not acceptable. The shaft shall be one-piece construction without joints or stubs attached.
2. Multiple row lower bearings for axial thrust and a single row upper bearing for radial thrust shall support the motor/pump shafts. Bearings shall be sized to provide a minimum L-10 life of 50,000 hours anywhere on the flow versus head curve. Thrust bearings shall be restrained from thrust in both directions. Designs that do not protect the pump/motor from thrust in reverse directions shall not be acceptable.
3. All shafts shall be dynamically balanced and shall be amply sized to minimize shaft deflection. The distance from the lower bearing to the hub of the impeller shall not exceed two times the shaft diameter when the shaft diameter is measured at the lowest bearing.
4. Bearings shall be sealed and grease lubricated.

C. MECHANICAL SEALS

1. Each pump shall be provided with an enclosed block mechanical seal with the seal housing and spring system constructed of AISI 316 stainless steel. The block seal housing shall be constructed such that it can be dismantled allowing the seal faces and springs to be renewed and the seal system to be put back into service. Cartridge seals constructed such that they cannot be repaired or renewed shall not be acceptable. Both upper and lower seal faces shall be silicon carbide versus silicon carbide.
2. The seal shall be mounted in a separate and isolated seal chamber. The seal chamber shall be filled with non-conductive lubricating oil as recommended by the manufacturer.
3. A moisture sensor shall be furnished to sense seal failure for each pump. This sensor shall be wired to the Pump Control Panel (specified in Division 16) and shall activate an alarm light upon seal failure. The sensor probe shall be mounted in the seal chamber and shall be of the conductive type, sensing moisture intrusion above the lower seal, but below the upper seal. Designs which sense seal failure above the upper seal through the use of a float switch are not acceptable.

D. POWER AND CONTROL CABLES

1. Power and control cables shall be furnished in lengths to run un-spliced from the pump to the pump control panel as shown on the Contract Drawings and as specified herein. Cables shall terminate with conductor sleeves that bundle the entire group of strands of each phase to improve termination at the pump control panel. The sleeves shall be provided to confirm that all strands of each conductor are terminated properly. Termination shall be coordinated with the connection to the Pump Control Panel.
2. Cables shall be of the "NSSHOU" type and shall be approved by the MSHA for use in hazardous locations and shall conform to industry standards for loads, resistance under submersion against sewage, and be of stranded construction. The cables shall enter the pump through a heavy-duty galvanized cast iron entry assembly which shall be provided with an external clamp assembly to protect against tension once secured providing a strain relief function as part of standard construction.
3. The cables for each pump shall pass through the galvanized cast iron strain relief component and then through a series of stainless-steel disks and Buna-n grommet that is sandwiched between the disks to control compression of the grommet. The cable entry design shall be of the type recommended in the Factory Mutual Research Corporation specifications for Explosion Proof Certification. The entry shall be comprised of the cast iron fitting that will include the Buna-N strain relief grommet coupled with a poured conductor section. In the poured section, only Factory Mutual approved sealant shall be used to wick into each conductor strand that has the insulation removed in this area to provide a positively leak-proof seal for the power and sensor cords.

COMMERCIAL GRINDER PUMPS

Pumps shall be supplied as shown by the plans two (2) Keen submersible grinder pumping unit(s) specifically designed to pump slurries of grit, debris and organic solids without clogging.

PUMP CONSTRUCTION

1) SUBMERSIBLE MOTOR CONSTRUCTION

- A. All castings in the stator housing construction shall be ASTM A48 Gray Cast Iron Class 35.
- B. The submersible motor stator and rotor shall be of an induction type, NEMA® L (Single-Phase) or NEMA® B (Three-Phase) squirrel cage design.
- C. The stator is to be press-fit in watertight oil-filled, TENV chamber to provide the maximum heat dissipation.
- D. The armature assembly of the motor must meet or exceed the balance specification as defined in ISO 1940 G2.5.
- E. Stator housing shall be filled with clean, high dielectric oil that lubricates bearings and seals, transferring heat from windings and rotor to the outer cast housing.
- F. Proprietary KEEN I.C.E. oil ensures industry-low operating temperatures. KEEN I.C.E. oil is a synthetic blend with wear-additives, specifically engineered for submersible pump motors.
- G. Submersible motor design:
 - i. _____ Horsepower
 - ii. _____ RPM
 - iii. _____ Voltage
 - iv. _____ Phase
 - v. _____ Frequency
 - vi. 1.20 Service Factor
- H. Insulation system of the submersible motor design shall be of Class F as defined in NEMA® MG-1 and established in accordance with IEEE® std. 1 rated for 311° F (155° C). To include:
 - i. The stator windings shall be constructed of material to meet the Class F insulation system.
 - ii. The insulation varnish in the system must be applied in a dip and bake manner.
 - iii. Stator lead material must meet or exceed Class F insulation system.
 - iv. Thermal limiting device shall be designed, secured to the stator and constructed to meet the Class F insulation system.
 - 1. The thermal limiting devices shall be attached to each phase winding.
 - 2. The thermal limiting devices shall be used in conjunction with and supplemental to external motor overload protection and must be connected to the motor control center.
- I. Operation of the motor shall be designed for:
 - i. Intermittent duty handling pumped media of 140° F (60° C) ambient and shall not exceed NEMA® Class B operating temperature rise of 176° F (80° C).
 - ii. Capable of 10 evenly spaced starts per hour.
 - iii. A combined service factor, in combination with effect of voltage, frequency and specific gravity, shall be at a minimum of 1.00.
 - 1. Acceptable voltage variation is +/- 10%.
 - 2. Acceptable frequency variation is +/- 5%.
 - 3. Voltage unbalance must not exceed 1% as defined per NEMA MG-1 12.45.
 - 4. Current unbalance must not exceed 5%.
 - iv. The horsepower of the motor shall be adequately designed to be non-overloading across the entire pump performance curve, to include pump shut-off and pump run-out.
- J. The submersible motor and pump must be designed, constructed and assembled by the same manufacturer.

2) SUBMERSIBLE MOTOR CORD ENTRY CONSTRUCTION

- A. The cord entry housing shall be ASTM® A48 Gray Cast Iron Class 35.
- B. Power and control cables shall be secured and sealed to the submersible motor. Construction shall be of a method to provide anti-wicking barriers to the submersible motor.
 - i. The outer jacket of the power and control cables shall be sealed with an agency-approved, watertight strain relief cord grip fitted with a nitrile compression grommet or rubber compression grommet.

- ii. The connections between the power cable and the stator leads and control cable and the internal motor control leads shall be potted and encapsulated in a two-part epoxy in the cord entry system.
 - C. All bolted connections in the cord entry construction shall be:
 - i. Secured with 304 stainless steel fasteners.
 - ii. Secured joints in the construction shall be compression fitted with nitrile O-rings.
 - D. The power and control cables shall be recognized by Underwriters Laboratory® (UL) & Canadian Standard Association® (CSA) and will be delivered in a standard length of 40 foot.
 - E. The cord entry housing shall be fitted with a stainless-steel lifting bale sized and of adequate design to securely lift the complete construction of the submersible grinder pump.
 - F. The power and control cables shall be jacketed in a material suitable for submersion, oil resistant, and be flexible for portable installation.
 - G. Cable sizing shall be in accordance to NEC® specifications.
- 3) MECHANICAL SEALS
- H. Each pump shall be constructed with a tandem mechanical shaft seal system incorporating two independent shaft seal assemblies.
 - I. Seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the seal faces at a constant rate.
 - J. Inboard and outboard seal construction shall be of the following material:
 - i. Primary stationary ring shall be constructed of silicon carbide face material.
 - ii. Primary rotating ring shall be constructed of silicon carbide face material.
 - iii. Elastomers shall be constructed of Viton® materials.
 - iv. Metal components shall be constructed of stainless steel for corrosion resistance.
 - K. The inboard shall be hydro-dynamically lubricated and operated in a sealed oil reservoir.
 - L. The inboard seal chamber seal shall be designed and constructed to prevent lubricant over-filling and provide adequate lubricant expansion to avoid over-pressuring of the seal.
 - M. The pump shall be capable of operating in the clockwise or counter clockwise direction without damaging the seal faces.
 - N. The pump shall be capable of operating in a dry environment without damage to the seal faces.
 - O. Class 1, Division 1, explosion-proof models shall contain an additional line bearing seal constructed of bronze, CDA836 material, and is mounted in the lower seal housing.
 - P. The line bearing seal will minimize shaft deflection and serve as the flame path for the motor assembly.
- 4) PUMP BEARINGS
- Q. Bearings shall be designed to an ABEC® System 1 or better.
 - R. Each pump shall be constructed with a two-bearing system design.
 - i. The upper bearing shall be a Conrad type, single row, deep groove ball bearing designed to adequately handle the required radial loads.
 - ii. The lower bearing shall be a Conrad type, single row, deep groove ball bearing designed to adequately handle the required radial loads.
 - S. The bearings shall be designed to deliver a minimum L-10 bearing life of 100,000 hours when operation is within the limitations of the manufacturer's performance curve.
 - T. The bearings shall be lubricated in oil and will not require maintenance as described in ANSI/HI 1.4-2010 A.6.
- 5) PUMP SHAFT
- U. The pump shaft shall be an extension of the motor shaft. Any other construction that would include coupling of two shafts is not acceptable.
 - V. The pump shaft shall be a Ferritic grade AISI® Type 400 series stainless steel.
 - i. Pump shaft material crystal structure shall be body centered cubic (bcc).
 - ii. Pump shaft shall be of a ferromagnetic material.
- 6) IMPELLER

- W. Material shall be ASTM® A536 ductile cast iron. ASTM® A48 grey cast iron shall be unacceptable.
- X. The design shall be one-piece, 10-vane, vortex flow and dynamically balanced to ISO 1940 G6.3.
- Y. The impeller shall be designed with pump out vanes on the back shroud of the pump impeller to prevent the pump media from entering the outboard seal cavity.
- Z. The impeller shall be threaded to the pump shaft.
 - i. All wetted fasteners shall be of a corrosion resistant stainless steel material.
- AA. The mass moment of inertia calculations shall be provided by the pump manufacturer upon request.

7) GRINDING MECHANISM

- BB. The grinder assembly shall consist of a single rotating grinding cutter and stationary grinding ring secured to the inlet of the volute case.
 - i. The rotating grinding cutter shall be threaded onto the pump shaft and secured with a washer and bolt.
 - ii. The stationary grinding ring shall be secured in place with a metal clamping ring.
- CC. Both the stationary and rotating grinding mechanisms shall be removable without disassembling the pump.
- DD. No adjustment or shimming grinder assembly shall be necessary.
- EE. The grinder components shall be constructed of a martensitic AISI 440C stainless steel hardened to 56-60C Rockwell.
- FF. The grinder mechanism shall be capable of producing 12,400 cuts/second.

8) VOLUTE CASE

- GG. Material shall be ASTM® A48 class 35 gray cast iron.
- HH. Design shall be a single piece and a modified constant velocity.
- II. Constructed of smooth passage ways large enough that any macerated solid can enter the impeller.
- JJ. The discharge is to be of a horizontal centerline configuration.

The discharge is to be 2-1/2" or 3" ANSI® standard Class 125, 4 – bolt configuration.

4.121 SUBMITTALS

- A. Submit shop drawings and product data.
- B. Submit manufacturer's installation instructions.
- C. The submittal data shall be prepared, in its entirety, by the equipment manufacturer and each page shall be initialed by the manufacturer's employee responsible for the preparation of the data. Shop drawings prepared by the manufacturer's sales representative, fabrication shop or other than the listed manufacturers shall not be acceptable. No additions or modifications to the manufacturer's submittal will be accepted, with the sole exception of a cover sheet provided by the manufacturer's local representative.

4.122 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include installation instructions, assembly views, lubrication instructions, and replacement parts lists.

4.123 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle and protect.

4.124 SERVICES OF MANUFACTURER

- A. Furnish the services of a representative of the pump manufacturer to assist in adjusting and testing the equipment furnished, to supervise the initial operation, and to make final adjustments as may be necessary to assure the OWNER that the pump(s) is (are) in satisfactory operating condition.
- B. Furnish sufficient supervision, data, and information from the manufacturer to train operators in the proper operation and maintenance of the pump(s) furnished.

4.125 PERFORMANCE

- A. The pumps shall be designed for continuous operation and will be operated continuously under normal service.
- B. Operation Criteria:

	Flow GPM	TDH FT	Max. Pump RPM	Solids Passage	Min. Suction Dia.	Min. Disch. Dia.	Min. Motor Size
Design Condition							
Secondary Condition							

PUMP TAKE OUT SYSTEM

Pump Take Out System 4" and larger shall be manufactured by Barney's Pumps

Pump Take Out System 3" and smaller shall be manufactured by Conery Products

A. Pump Take Out System

- 1. The pump supplier shall include a take out system for the pump, designed such that the pump can be removed from the installation without entering the pit or disconnecting the discharge piping.
The pump take out system shall consist of a foot mounted discharge elbow and slide away coupling, adapter, steel base riser, upper and lower guide stainless steel rail supports and stainless steel lifting chain.
 - a. The coupling halves shall be angled, and the locking lugs shall be adjustable in order to eliminate any mechanical looseness that could cause leakage.
 - b. The slide away couplings shall be designed for use with two stainless steel schedule 40 guide rails. 2" pipe size for non-clog / 1" pipe size for Grinder Pumps
 - c. The foot mounted discharge elbow and adapter shall be cast iron, ASTM A 48 Class 30.
 - d. The slide away coupling shall include a self-energizing U cupped rubber gasket for non-clogs and oring type for grinders, to provide positive sealing under all conditions. This gasket shall be serviceable from top as required with pump removal.

4.12 VALVES AND PIPING:

A) DUPLEX NON-CLOG STATIONS

1. Piping shall be HDPE SDR11
2. Gate valves shall be cast iron Mueller A-2360 resilient wedge gate valve.
3. Check valves shall be cast iron Mueller A-2600 swing type lever and weight check valve.

B) DUPLEX GRINDER STATIONS 2HP AND LARGER:

1. Piping shall be 304L stainless steel pipe.
2. Gate valves shall be stainless steel Matco-Norca gate valve model# 20SSTHM.
3. Check valves shall be stainless steel Matco-Norca swing check valve model# 60SSTH.

Valves and piping shall be located as shown on the drawings.

4.13 ELECTRICAL:

- A. General: All electrical material and equipment provided by the Contractor shall be new and free of defects. All work performed under this section of the specifications shall be carried out by skilled workers regularly engaged in the performance of such duties. The entire electrical installation shall be not less than that required by the latest edition of the National Electrical code, the Occupational Safety and Health Act, and all electrical codes locally enforced in the project area. The Contractor shall obtain all permits required by local ordinances and after completion of the work, shall give the Engineer a certificate of final inspection and approval from the local Electrical inspection office. Any expenses connected with such inspection and certificate shall be borne by the Contractor.

Electrical material and equipment shall be designed in accordance with the latest requirements of applicable standards such as NEMA, ANSI, IEEE, and where listings are available for such items, shall be approved by the Underwriters Laboratories, Inc. Equipment, components, material, etc., rated by other standards and agencies including but not limited to IEC, VDE, and DIN will not be considered equal to NEMA, ANSI, IEEE, and UL. Electrical items shall be standard cataloged products of manufacturers regularly engaged in the manufacture of such products, unless otherwise noted.

B. Grounding:

1. Non-current carrying metal parts of electrical items such as cabinets, enclosures, frames, etc., and the neutral conductor shall be grounded in

accordance with the National Electric Code unless additional grounding requirements are indicated. Grounding conductors shall be copper, sized as noted. Special grounding system features shall be provided as indicated.

2. All conduit runs installed for lighting and power loads shall contain a grounding conductor throughout the entire length of the run forming a part of the grounding system. The grounding system shall be electrically continuous throughout the electrical system and shall be connected to earth ground at the point of power service and as otherwise indicated.
3. Ground rods shall be copper welded steel type, $\frac{3}{4}$ inch diameter, 20'-0" length, minimum. Ground rods shall be driven to 1" – 0" (minimum) below finished grade unless otherwise indicated and shall be electrically connected with suitable cast type ground clamps or exothermic welding.
4. Resistance to ground of each ground rod shall not exceed 10 ohms when measured during dry weather. In the event this value is not obtained, one additional rod or rod section equal to that tested shall be driven. Should the additional rod or section fail to achieve the required value, the Engineer shall be immediately notified. A written record of all resistance measurements and test dates shall be submitted to the Engineer prior to completion of the project.

C. Lightning and Surge Protection:

1. Lightning protector unites shall be provided for power circuit protection at the main service connection point and elsewhere as noted on the plans. Lightning protectors shall be Intermatic for three and single phase circuits respectively.

D. Insulation Tests:

1. Circuit insulation tests shall be performed to prove each circuit free of faults after all wiring is completed prior to equipment and fixture connection, and again after the installation is complete and ready to use.
2. Tests shall be made at the main electrical service connection between all conductors and between line conductors and ground. Tests shall be made with a 1,000 Vdc instrument capable of accurately measuring the resistance involved. Readings shall be taken in the presence of the Engineer or his representative for each test and the written results of each test shall be submitted to the Engineer.

E. Conductors:

1. Single conductors installed in raceways shall be copper and AWG sizes as noted and shall have 600 volt rated, type THW/THHN/THWN or XHHW, 75° C (minimum) insulation. Conductors requiring special consideration shall have insulation material and ratings noted on the plans and as required by the National Electrical Code. Type TW insulation shall not be used for any purpose in this contract except ground wire identification only.
2. Lightning and power conductors shall be minimum size No. 12 AWG, with AWG No. 8 and larger to be stranded, and AWG No. 10 and smaller to be solid unless otherwise noted. Conductors shall be stranded where movement, vibration, or other flexing occurs in order to prevent conductor fatigue. Control conductors may be AWG No. 14 stranded, unless otherwise noted.

3. Insulation colors shall be: green for ground; white for neutral; and black for single phase line conductor. "Stinger" phase conductor of 120/240 V systems shall be orange as per NEC 215.8. Unless otherwise noted, a uniform insulation color scheme for all new three phase systems shall be established as black for phase A, red for phase B, and blue for phase C. Control circuit insulation shall be yellow. Conductors size AWG 10 and larger may be black with entire exposed tends taped with "Scotch #35" or equal by Plymouth, in accordance with color schemes mentioned herein.
4. Direct buried grounding system conductors shall be bare copper, sized as noted.

F. Splices and Terminations:

1. 600 volt system conductors shall be spliced with "Ideal Wire-Nuts" or equal by T & B for AWG No. 10 and smaller for dry areas and machine crimped or bolted connectors with "Scotch 88" or equal by Plymouth full coverage tape for all other splices. Soldered and taped splices will not be acceptable. Terminations shall be made with mechanical lugs or other acceptable termination features of the equipment supplied.
2. Control conductors shall terminate on box clamp, grinding post screw, or set screws only. Soldered, taped and free-standing connections will not be acceptable.

G. Conduit:

1. Steel conduit shall be provided unless otherwise indicated and shall be heavy-wall, rigid galvanized type bearing the Underwriter's Laboratories, Inc. label of approval. Conduit minimum size shall be ½ inch. Fittings for rigid steel conduit shall be threaded types made up with conductive waterproof compound. Seal-off fittings shall be provided as required by the National Electrical Code.
2. All conduits shall be clean and free from dents, scars, or other deformities. Connections shall be made watertight and bushings shall be provided where smooth hubs are not encountered. Changes in directions shall be made with symmetrical bends or conduit boxes. Field made bends shall be made with an approved hickey or conduit bending apparatus. Conduit runs shall be installed parallel or perpendicular to structural members. Conduit hangers and supports

4.14 PANEL

- A. General: All electrical components and materials supplied shall function as a complete unit to automatically control the pump down of the sewage pump station wet well. All devices and material shall be new and of standard product design. Electrical work shall be in accordance with the latest edition of the National Electrical Code (NEC) and subject to local codes. Panel supplier shall be a certified UL 508 manufacturer. Panel shall be as manufactured by **Ohio Electric Controls**.

All power wire shall be stranded copper and sized as required for load and application according to NEC. All control and signal wire shall be a minimum of #16 AWG, 90 degree C insulated and color-coded. Colors shall be red for all AC control, blue for all DC control, yellow for external source control, white for AC neutral

and green for equipment ground wiring. All wiring on the rear of the inner door shall be neatly bundled using tie wraps or other means. All internal wiring on the backplate shall be neatly routed in wire duct with removable covers. All wiring shall be continuous point to point (no splices) and be totally accessible.

- B. Scope and Panel Operation: The control panel shall provide power and logic control to operate two submersible pumps at the rated voltage and FLA of the pump motors. The control voltage shall be 120-Volt, single phase.

The control logic shall provide for the automatic operation and alternation of the lead pump under normal conditions. If the incoming flow exceeds the pumping capacity of the lead pump, the lag pump shall automatically operate to handle the increased flow. As the wet well level decreases, both pumps shall shut off at the pumps off level. In the event of a pump failure or a flow that exceeds the capacity of both pumps, a high alarm level shall operate a red flashing alarm light. The pump designated as lead pump shall alternate each duty cycle

- C. Enclosure Construction and Materials: The pump controls shall be housed in a NEMA 4X, 304 Stainless Steel enclosure sized to house all the required components and allow adequate space for testing and maintenance as necessary, with minimum enclosure size 36"X30"X12". The enclosure shall have a drip shield, padlockable three-point latch (clamp hasp are not acceptable), steel back plate painted white, continuous door hinge, and an aluminum inner door with continuous hinge to protect all live internal wiring from operator personnel. The inner door shall be able to open a minimum of 150 degrees to allow safe access to the components. All controls, switches, indicator pilot lights, and elapsed time meters shall be mounted through the inner door.

All other components shall be securely mounted to the backplate with stainless steel hardware through machine thread tapped holes in the backplate. The screws shall be of adequate size for the device being secured. Permanent marking to identify each component as shown on the drawing shall be provided on the back plate and schematic laminated on inside of enclosure door.

- D. Duplex Pump Controller:

The model PC1 is a float switch based duplex pump controller intended primarily for wastewater lift station pump down applications. It includes sensor inputs for the seal fail and temperature fail sensors for most submersible pumps. It connects to four float switches to measure the tank level and has relay outputs to control two pumps and a high alarm light. It has built in HOA (hand-off-automatic) switches and pump running lights. A lead pump selector switch permits either pump to be selected as lead pump or alternation can be selected causing the pumps to alternate as lead. The PC1 uses removable terminal strips to make replacement in the field quick and easy.

The PC-1 uses four normally open floats as level sensing inputs so when the tank is empty all of the floats are open. On rising water, the Off float closes first which causes the controller to take no action. The Lead float will close next as the water rises. The controller will then turn on the lead pump. If this pump causes the water level to fall the lead pump will be turned off when both the Lead and Off float are out of the water and open. If the lead pump is not sufficient to control the water level then the lag pump will be started when the Lag float closes. The two pumps will not be turned off until the Lag, Lead, and Off floats are out of the water and open, at which time, all pumps will be turned off. The controller has delays built into the software, which will ensure that whenever a pump is turned on, the second pump cannot come on for at least 8 seconds. Another delay ensures that when a pump is turned off the other one cannot turn off for 4 seconds. These delays help ensure

smooth pump operation and prevent excessive electrical surges.

The last float input is for the High float. Whenever the high float is under water (closed) then the high alarm condition is set. A jumper on the circuit board selects one of two high alarm options. When the jumper is in, the high alarm relay and panel indication will flash on and off. If the jumper is out then the high alarm relay and indicator will remain on continuously until the high float is out of the water and open.

The pump controller has two inputs for pump seal fail (leak) sensors (one for each pump). These inputs measure the resistance between the input and ground. If the resistance is less than 2000 ohms then the seal fail indicator for that pump will be turned on. This action does not disable the pump.

The pump controller has two inputs for pump temperature sensors. If the controller detects a short between these inputs and ground then a temperature failure condition does not exist. If the short to ground is removed then a temperature failure condition exists and the pump associated with that input will be disabled and the Temp Fail indicator illuminated. This condition does not latch up and will return to normal if the short to ground is reestablished.

All of the float and sensor inputs are transient protected and filtered to prevent electrical interference from causing improper operation.

The controller has two switches that select what mode the two pumps are in. These HOA switches have the following function:

H When in HAND the pump will be constantly called to run.

O When in OFF the pump will be off.

A When in AUTOMATIC the pumps will be called by the pump controller. The Hand and Off functions of these switches will operate even if the controller is off or has failed.

The controller has a switch that is used to select the lead pump. When this switch is in the center position (ON) then the two pumps will alternate as lead pump each pump cycle. When in the 1-2 position then pump one is the lead and when in the 2-1 position pump two is the lead.

The controller has two inputs, which should be connected to the auxiliary switches on the two motor starters. These inputs, when shorted, cause the pump running indicators to be illuminated. Using these inputs may eliminate the need for panel-mounted pump running lamps.

- E. Control Panel: Provide properly sized transfer switch for main and emergency power, Square D motor circuit breaker, IEC Telemecanique motor starter with overload protection or Square D ATS soft start as required (20HP and larger), ground and neutral block, fused 115V control circuit with circuit breaker, phase monitor relay, and lightning arrestor (shipped loose for installation at incoming feed by the contractor). Elapsed Time Meters for each pump, Elapsed Time Meters for simultaneous pump run non-reset type, HOA switches, pump run indicator lights and general-purpose duplex GFCI outlet

minimum rating of 10 amps to be mounted on inner door. Provide circuit breaker for GFCI outlet. Provide weatherproof exterior 3 ½" diameter flashing alarm light with red Lexan lens mounted **on right side of control panel**.

- F. Site Visual Alarm System: The red alarm light shall be activated for pump failure and high water level.

4.15 WIRELESS MONITORING SYSTEM

The Wireless Monitoring System shall be manufactured by Mission Communications and shall be model number M113 or equal. It shall be incorporated into the construction of the control panel to insure the proper integration of the monitoring and control system. It shall be capable of reacting to various external alarm inputs to include 8 inputs as follows:

Input One: Pump One runtime
Input Two: Pump Two runtime
Input Three: Simultaneous pump runtime
Input Four: Spare
Input Five: Spare
Input Six: Spare
Input Seven: High Level One Input
Eight: High Level Two

In addition it shall report power/phase failure independent of the eight inputs.

It shall report these inputs/alarms to a central monitoring facility continuously operated by the monitoring company, which will in turn notify the designated local recipients via telephone, fax, email, pager or web determined by the local utility. The central monitoring facility shall also have the capability of responding to queries for information from the user via the WEB, and shall automatically generate useful reports giving details of all activity, and summary reports. The system and service shall be specifically designed and intended for use in the water and wastewater industry.

It shall have battery-back-up with integral charging to insure the report of all alarms in the event of power failure. It shall have an externally mounted key-reader to allow the technician to put the unit in service mode before servicing any equipment at the site.

It shall include a **dual element** highlevel alarm float to insure redundancy in the high level alarm notification.

4.16 STAINLESS STEEL CONTROL PANEL STAND

The control panel shall be supplied with a panel stand constructed from 2"x2"x.125" stainless steel tubing (**minimum 304 grade**) with a 9' overall height dimension with 5.5' to be above grade. The stand shall include a Nema 3r fused disconnect rated for the voltage and current range necessary to facilitate proper station operation. In addition there shall be space provided for the contractor installed meter base. The stand shall have the panel and disconnect mounted, pre-wired, and tested. (per drawing)

4.17 VENTILATED JUNCTION BOX

The control panel shall incorporate a Nema 4x Stainless Steel (**minimum 304 grade**) junction box permanently mounted to the bottom of the control panel enclosure to vent gases from entering the control space. This panel shall include an expanded metal removable front cover. In addition the cables shall be sealed into the control panel enclosure with the use of U.L. Listed

cord grips. (per drawing)

4.18 INSTALLATION OF PANEL STAND

The control panel stand shall be installed by equipment provider so as to meet all of the requirements of UTILITY. The cost for this installation shall be included in the pump suppliers pricing to the contractor. This installation shall include one full day of site work. It shall be scheduled with the contractor after all pump station site work has been completed. The installation shall include setting of stand per utility's recommended location and installation of conduit from wet-well to control panel. It shall **NOT include** installation of electrical service, installation of meter-base, or connection of the main power feed to the main disconnect, as this shall be the responsibility of the contractor.

4.19 INSTALLATION OF PUMPS AND FLOATS

The pumps and floats shall be installed by equipment provider so as to meet all of the requirements of the UTILITY. The cost for this installation shall be included in the pump suppliers pricing to the contractor. This installation shall include one full day of site work. It shall be scheduled with the contractor after all pump station site work including electrical service has been completed. This installation shall be the day before start-up to insure that the pumps are not installed in the wetwell for an extended period of time without power that could lead to premature failure.

4.20 START UP/PERFORMANCE TEST

The start up shall be conducted by equipment provider so as to meet all of the requirements of utility, the Engineer, and the requirements outlined by the equipment manufacture. The cost of the test shall be included in the pump supplier pricing to the contractor. This test shall include one full day of site testing. It shall be scheduled with the contractor, engineer, and local utility after all equipment installation has been completed. Reports shall be provided to the engineer and owner as per the utility's specifications immediately following commissioning of the lift station.

4.21 DRAWINGS AND MARKINGS

- A. Panel Markings: All component parts in the control panel shall be permanently marked and identified as they are indicated on the back plate, adjacent to the component.
- B. Nameplates: The panel shall include engraved nameplates on the inner door for all components to indicate the device function. The nameplates shall be permanently affixed with plated machine screws or a bonding adhesive suitable for the application.
- C. Final Drawings: Upon completion of the panel a complete set of As Built drawings and Bill of Materials shall be supplied to the owner. The drawings shall include a power and control schematic and a terminal block diagram showing each remote connection to the panel. An adhesive Mylar copy of the schematic drawings and terminal diagram must be permanently affixed to the inside of the control panel door.

4.22 WARRANTY

All equipment shall be warranted against defects in material and workmanship for a period of one (1) year from the date of Owner's final inspection and acceptance or eighteen (18) months from date of shipment, to the effect that any defective equipment shall be repaired or replaced, at the discretion of the supplier.

MONITORING RTU REQUIREMENTS

The monitoring RTU shall be enclosed in a NEMA 1 or NEMA4x enclosure. The RTU shall be powered by 12 volts AC and have a built in battery backup capable of keeping the RTU powered for 40 hours in case of primary AC failure. All terminations inside the RTU enclosure shall be low voltage AC or DC (28 volts or less).

The RTU shall have two (2) analog, 10-bit resolution, 4-20ma or 0-5 vdc inputs, with four (4) alarm thresholds per input. The RTU shall have built in wiring fault, AC failure, communication failure and low battery detection. The RTU shall have eight (8) digital inputs of which up to three (3) shall be capable of recording pump runtimes in one (1) minute resolution with hourly updates of runtimes and starts. The RTU shall have at least three (3) remotely controllable relay outputs. The RTU shall have up to two (2) optional pulse counting totalizers of which one can be programmed to report every 15 minutes.

The RTU shall have:

- Third generation cellular radios for transmitting data,
- Cellular carrier approvals of such cellular radios,
- Security encryption (128 bit) at all states of data transfer and storage,
- Private IP addresses for all field radio devices,
- Consolidated situation awareness and diagnostic screen graphics for operators,
- Electronic access control keys to track personnel, maintenance and alarm response,
- Automatic pump performance analysis to early detect problems,
- Integrated rainfall monitoring for determining inflow and infiltration,
- Audit/history reports of alarm dispatch events with phone call recordings,
- Alarm filters to reduce nuisance/false alarm callouts,
- Guaranteed service price stability,
- Guaranteed hardware replace costs.

The RTU shall be capable of reporting alarms and all supervisory information to a password protected customer web site, an OPC compliant HMI software package or both. The web site or HMI software package shall be capable of displaying all RTU alarms and supervisory data. This to include alarms, individuals accepting alarms, RTU electronic key/card reads with user names and time of read, pump, run times with historical graphs, individual pump flow estimates, automatic daily analysis of pump runtimes for abnormalities with automatic customer notification of such abnormalities, pump starts, hourly analysis of excess pump starts with automatic notification of non-reporting or poorly reporting RTU's, scaled and labeled pulse totalizations and if rainfall gauges are used, inter-day rainfall graphs. The customer web site or HMI software shall produce an audit report of every alarm or notification event with accurate results of all notification attempts. The customer web site or HMI software shall produce and deliver weekly reports which summarize alarms and responses, pump runtimes and flow estimates and all electronic key or card uses at the RTU sites.

The field hardware test transmissions shall indicate current and historical radio signal reception quality and shall report any radio signal outages and the duration of the outage.

The field unit shall be capable of optionally providing a method to monitor the wet well float circuit directly while providing auxiliary wet well alarm relay contact closures without the addition of a separate high wet well float. This optional circuitry shall detect high wet well conditions in the event of pump station AC failures.

RESIDENTIAL GRINDER PACKAGE SYSTEM

1.01 FIBERGLASS BASIN

1.01. Basin – The basin shall have a minimum dimension of 24” in diameter and 60” in depth. Basin shall be made from a fiberglass reinforced polyester resin. Resins used shall be of commercial grade polyester and shall be evaluated as a laminate test or determined by previous service to be acceptable for the intended environment. The reinforcing material shall be a commercial grade of glass fiber having a coupling agent to provide a suitable bond between the glass reinforcement and the resin. The manufacturer may supply either (continuous strand, chopped-strand, continuous mat and/or non-continuous mat) or (non-continuous glass strands having fiber lengths from 0.5 to 2.0 inches). The completed material shall be inert and acceptable to the environment. The basin shall be water-tight.

1.02. Inner Surface – The inner surface shall be smooth and resin rich, free of cracks, exposed fibers, porosity and crazing.

1.03. Exterior Surface – The exterior surface shall be relatively smooth with no exposed fibers or sharp projections. If a pigment is added, color should be relatively equal throughout. Foreign inclusions, dry spots, pinholes or pits, de-laminations, large dimples not meeting thickness requirements, and air bubbles are not acceptable.

1.04. Tank Wall – Wall thickness shall vary with the basin height to provide the aggregate strength necessary to meet the tensile and flexural physical properties requirements. The basin wall laminate must be designed to withstand wall collapse or buckling based on:

- A. Wall thickness (see prior statement)
- B. Hydrostatic pressure (62.4 lbs per square foot)
- C. Saturated soil weight (120 lbs per cubic foot)
- D. Soil Modulus (700 lbs per square foot)
- E. Pipe stiffness values as specified (ASTM D3753)

Tank wall laminate must be constructed to withstand or exceed (2) two times the actual imposed loading on any depth of basin.

1.05. Tank Bottom – The basin bottom shall be of sufficient thickness to withstand applicable hydrostatic uplift pressure. In saturated conditions, the center deflection of the empty basin bottom shall be less than 3/8” (elastic deflection) and shall not interfere with bottom pump mounting requirements. Any mounting studs, plates, cap screws into tank bottom should be stainless steel and resin covered except for threads. Any inserts should be stainless steel and resin covered except for threads.

1.06. Tank Collar (Anti-Flotation) – A means to counteract buoyancy forces shall be provided on the tank bottom in the form of a ring, and shall extend a minimum of 3” beyond the O. D. of the basin wall. Wall and collar should be blended with a radius not to exceed 1 1/2” beyond wall O.D.

1.07. Top Flange – The top flange should be parallel to the tank bottom/collar and perpendicular to the tank wall. Stainless steel inserts shall be embedded in the top flange for securing the basin cover. The inserts shall be totally encapsulated to prevent turning (minimum turning torque should not be less than 30 foot/lbs.) and pullout.

2.01. BASIN COVER

2.01.1. A one piece 24” dia. fiberglass cover shall be provided for each installation. The cover shall be grass green in color. The cover surface shall have a non-skid design, and shall be water-tight. Cover shall be bolted to the basin with stainless steel 3/8” bolts and stainless steel fender washers. Covers are designed for “light duty” loading. Design of cover allows for basin to be mounted 1” above grade.

2.01.2. VENT to be installed on cover to prevent sewage gases from accumulating inside the basin. Cover shall have vent flange factory-mounted to accept the vent. Vent to be non-metallic “mushroom” style, with adequate bug screen. Optional sewer popper may be provided.

3.01. BASIN ASSEMBLY

3.02. PUMP DISCHARGE ASSEMBLY for each pump shall consist of a vertical 10.25”

- long 1-1/4" ss nipple, 1-1/4" ss tee, 3/4" brass air release valve, 3/4" SS pressure relief valve, 28.5" long 1-1/4" horizontal flex hose, 1-1/4" schedule 80 pvc single union ball valve, 1-1/4" brass check valve, and 1-1/4" NPT stainless steel discharge flange mounted 16" down.
- 3.03. CHECK VALVE to provide a full-ported passage when pump is running, and shall prevent backflow while offering full flow performance with minimum amount of turbulence or pressure loss. Valve to be rated at 200 W.O.G., non-shock, and be of heavy-duty cast brass. This valve shall be mounted directly via SS close nipple to the stainless steel discharge hub on the inside of tank.
 - 3.04. BALL SHUTOFF VALVE shall be furnished as an integral part of the internal piping assembly. Valve shall have Teflon seats and all non-corrosive parts. Valve to be rated at 150 W.O.G., and be constructed of schedule 80 PVC.
 - 3.05. An adequate length 3/8" polyethylene rope shall be supplied for removing the pump. The rope shall be of sufficient length and strength for easy removal.
 - 3.06. INLET GROMMET to be one-piece, flexible basin inlet grommet for 4" SCH 40 plastic pipe and shall be shipped loose for field installation.
 - 3.07. JUNCTION BOX/SPLICING shall not be permitted on standard applications. Pump and float wires shall be pulled in approved conduit continuous from tank to control panel.
 - 3.08. CONDUIT GROMMET to be one-piece, flexible basin inlet grommet for 1.5" pvc conduit and shall be shipped loose for field installation.
 - 3.09. CONDUIT SEALING-The incoming pump and float cables shall be sealed by external means, (supplied by others), so that condensation from the conduit will not enter the enclosure. The interior of the enclosure shall be of adequate size to accommodate the wires and connections for pump and level control operation.
 - 3.10. LEVEL CONTROLS – 4 Control-duty, narrow angle float switches shall be included with basin package. Switches to be designed for sewage environment, and be utilized to signify sewage levels or for direct alarm actuation. They shall be pre-mounted at the appropriate level on 3/4" schedule 80 pvc.
 - 3.11. CONTROL PANEL – Grinder pump station to include a control panel suitable for wall mount. Panel to be rated NEMA 4X with corrosion-resistant thermoplastic enclosure, deadfront, and have lockable latch. Panel shall have (2) QOU 30 amp double pole breakers with interlock for transfer of generator or utility service power and shall include a 4 wire industry standard 30 amp weatherproof twistlock receptacle mounted on the outside of the panel. Pump short circuit protection shall include (1) Square D QOU 20 Amp double pole circuit breaker for power. Control circuit to have (1) Square D QOU 10 Amp single pole circuit breaker for control. One Schneider IEC rated LC1 contactor with overload-manual reset. Panel to include push-to-run spring return switch. Keen Pump start kit to include, start capacitor, run capacitor, and potential relay. All simplex panels shall operate on four-float setup, which includes redundant off. Panels to include visual high-water alarm indicator. Visual alarm light shall be installed inside a red lens, mounted to top of enclosure. Mounting will maintain NEMA 4X rating and be adequately mounted above the tank so that during a power outage no liquid can back up into the panel.
 - 4.01. Pump Model – Pump shall be of the progressive cavity type, KPCGSL-21-SS, with an integrally built-in slicer grinder unit and submersible type motor.
 - 4.02. Operating Conditions – The pump shall have a capacity of 10 GPM at a total head of 174 feet, and shall use a motor rated at 1 HP and 1750 RPM. The grinder unit shall be capable of macerating all material in normal residential and commercial sewage, including reasonable amounts of foreign objects such as sanitary napkins, disposable diapers, thin rubber, small wood, plastic and the like to fine slurry that will easily pass through the pump and 1-1/4" NPT discharge.
 - 4.03. Construction – Major pump components shall be of gray cast iron, ASTM A-48, Class 30, with smooth surfaces devoid of blowholes or other irregularities. All exposed fasteners shall be 304 stainless steel. All metal surfaces coming into contact with the pumpage, other than stainless steel or bronze, shall be powder-coat finished. Pump shall

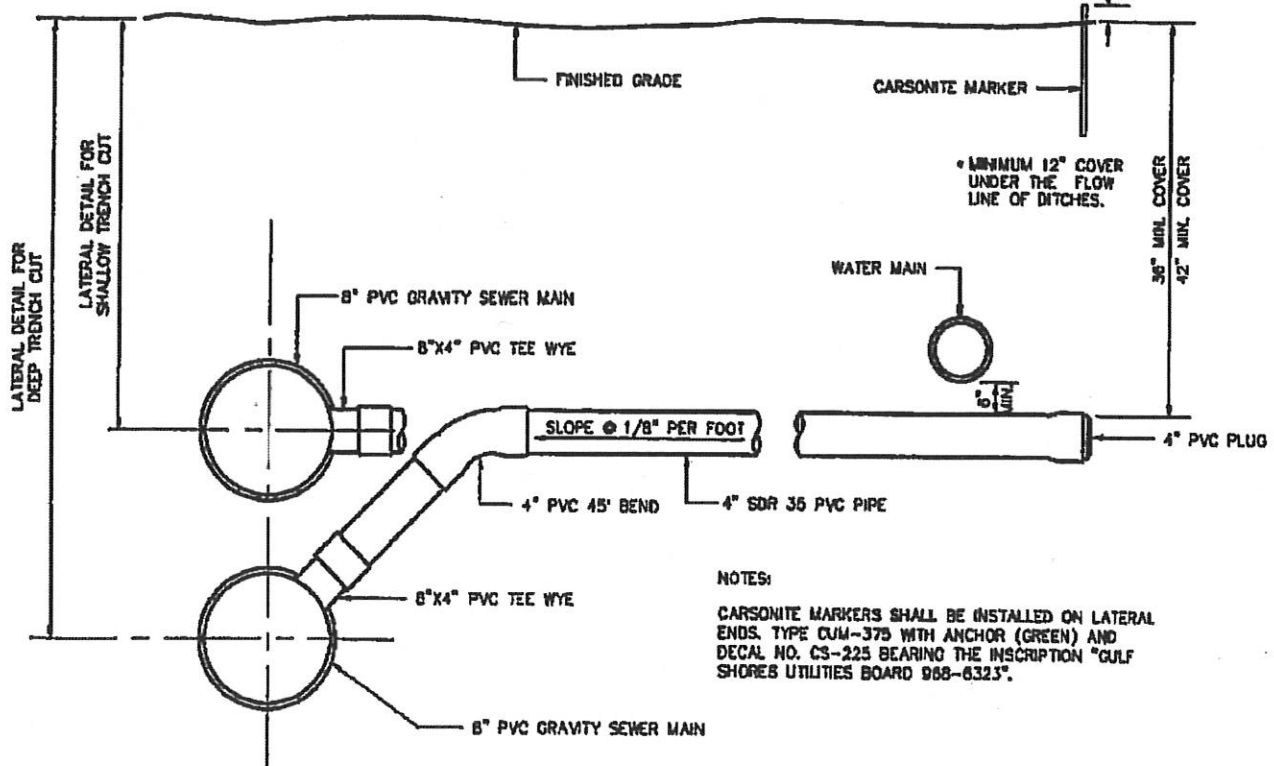
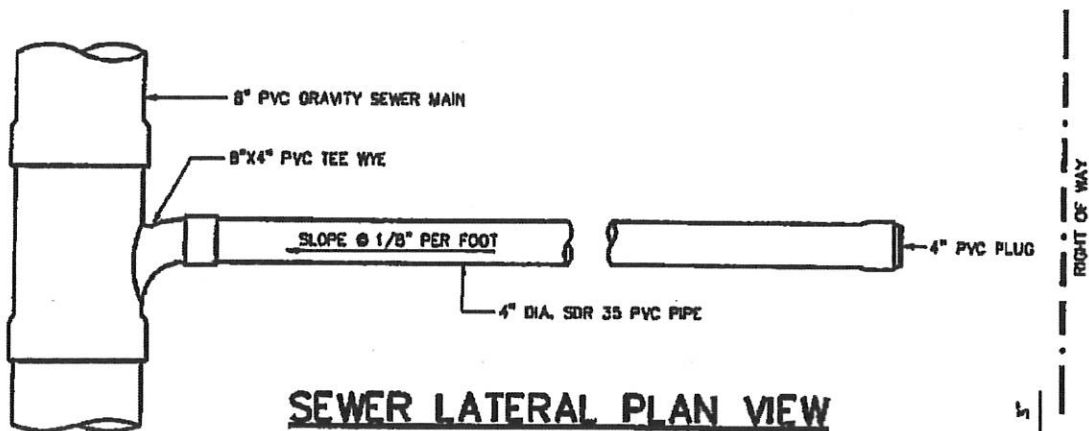
- be painted with (2) two coats, approximately 4-6 mil finish. Powder-coat paint shall be polyester powder, chemical and UV resistant.
- 4.04. Critical mating surfaces where watertight sealing is required shall be machined and fitted with O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used. All elastomers shall be nitrile.
 - 4.05. Rotor – Progressive cavity, full lobe, chrome plated hardened tool steel, hardness 60 Rockwell. Hardened Tool steel affords the KPCG pump superior resistance to abrasives and grit, when compared with stainless steel.
 - 4.06. Stator – Progressive cavity design stator that has a full lobe. Material shall be ethylene propylene synthetic. Stator material to be acceptable for wastewater, having good resistance properties to heat, weather, grease, detergents and abrasive materials.
 - 4.07. Stator Liner – Stator to be encapsulated by stator liner. Liner material shall be high density polyethylene. Liner to stabilize stator when in use, allowing for improved wear resistance and longer stator life.
 - 4.08. Grinder Construction – Both grinder slicer and shear plate shall be of 440C stainless steel hardened to 56-60 Rockwell C. The grinder assembly shall consist of a grinder slicer and shear plate mounted directly below the volute passage.
 - 4.09. Seal – Type 21, single mechanical seal construction, shall protect the motor. The mechanical seal shall be silicon / carbide. The seal face shall be lapped to a flatness of one light band. The seal shall run in an oil bath to insure proper lubrication and cooling.
 - 4.10. Motor – The pump motor shall be of the submersible type, rated 1 HP minimum, 1750 RPM. The motor shall be for 60 Hz 230 volt single-phase operation. Single-phase motors shall be capacitor start, capacitor run type for high starting torque. Start and run capacitors, and starting relay will be found remotely in a control panel for standard pump model. Major motor operating temperature must not exceed Class B ratings.

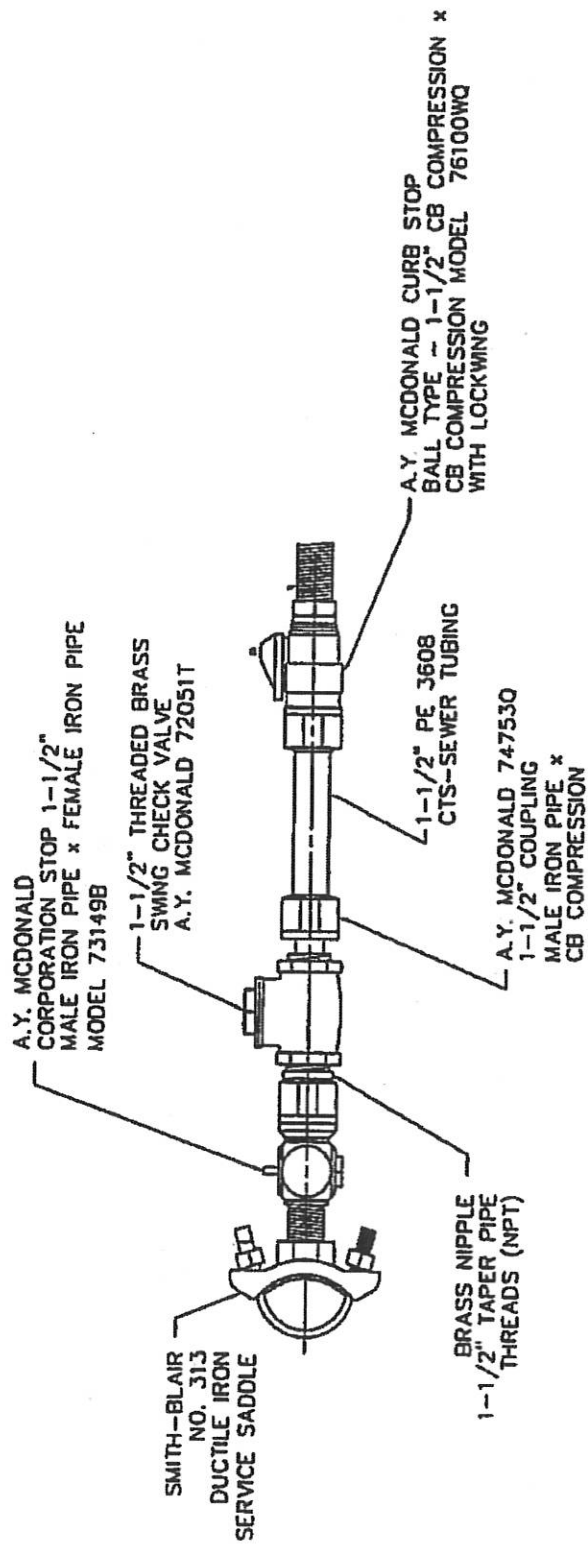
The stator winding shall be of the open type with Class F insulation. The stator shall be pressed into the cast iron motor housing. Winding housing shall be filled with clean, high dielectric oil that lubricates bearings and seals, transferring heat from windings and rotor to the outer cast housing. Proprietary Keen oil ensures industry-low operating temperatures. Air-filled motors, which do not have the superior heat dissipating capabilities of oil-filled motors, shall not be considered equal.

Single-phase motors shall have automatic reset over-temp protection attached to the top end of the motor windings to stop the motor if the motor winding temperature reaches 130 degrees C. The high temperature shut-off will cause the pump to cease operation, should a control failure cause the pump to run in a dry wet well. The overload shall automatically reset when the motor cools to a safe operating temperature.

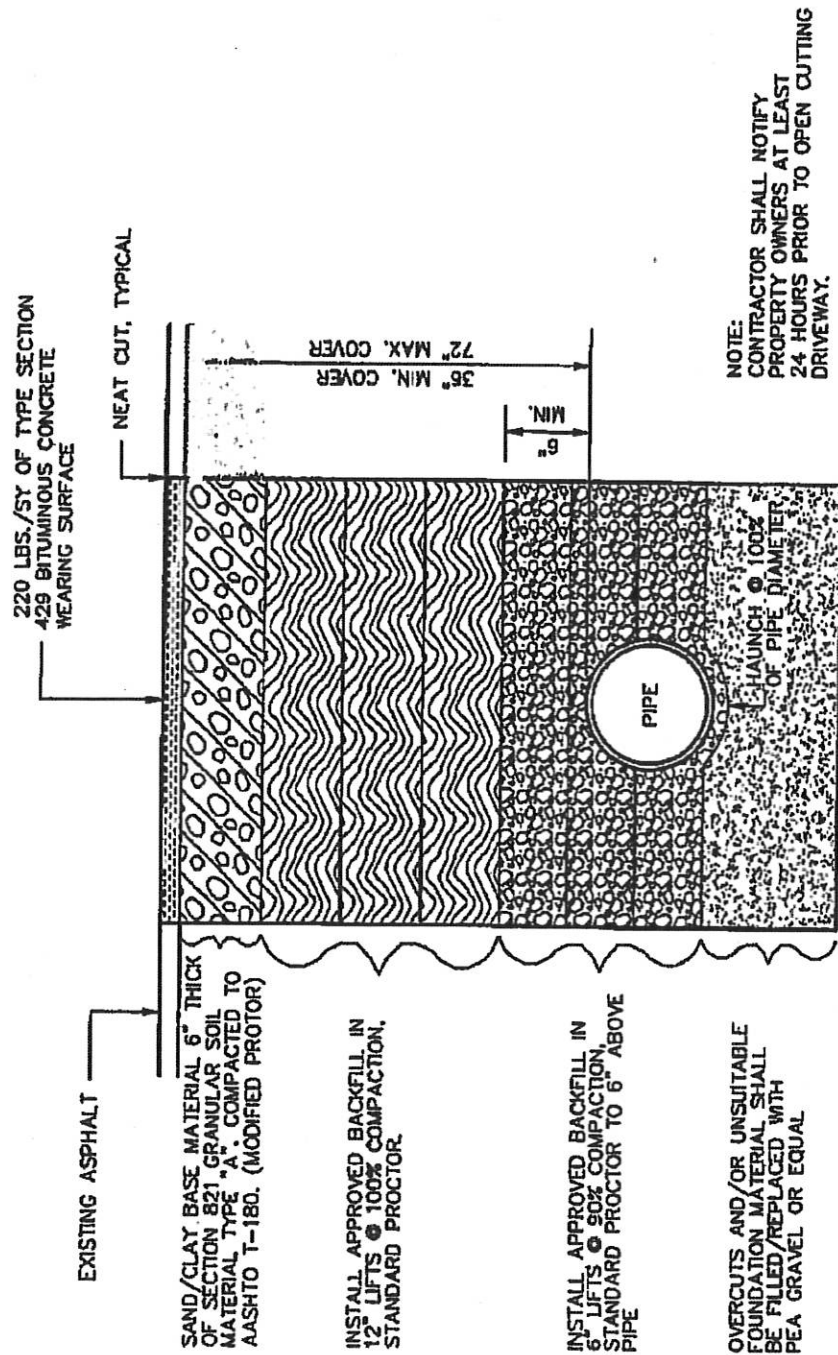
- 4.11. KEEN oil ensures industry-low operating temperatures. KEEN oil is a synthetic blend with wear-additives, specifically engineered for submersible pump motors. Air-filled motors, which do not have the superior heat dissipating capabilities of oil-filled motors, shall not be considered equal.
- 4.12. Bearings / Shaft - The motor shall have two heavy-duty ball bearings and one sleeve bearing to support the pump shaft, taking radial and thrust loadings. Sleeve bearing shall act as flame path for seal chamber. Ball bearings shall be designed for a minimum 50,000 hours B-10 life. The common motor pump and grinder shaft shall be of 416 SST, keyed to take the pump and grinder impeller.
- 4.13. Power Cord – The motor power cord shall be 12 Ga. Type SOOW, UL listed, CSA approved cable. The cable jacket shall be sealed at the motor entrance by means of an agency-approved rubber compression washer and compression nut. An epoxy-filled cord cap seals the outer cable jacket and individual leads to prevent water from entering the motor housing. Compression fittings with molded pins shall not be considered equal. Cord shall withstand a pull strain to meet FM requirements.

STANDARD DETAILS

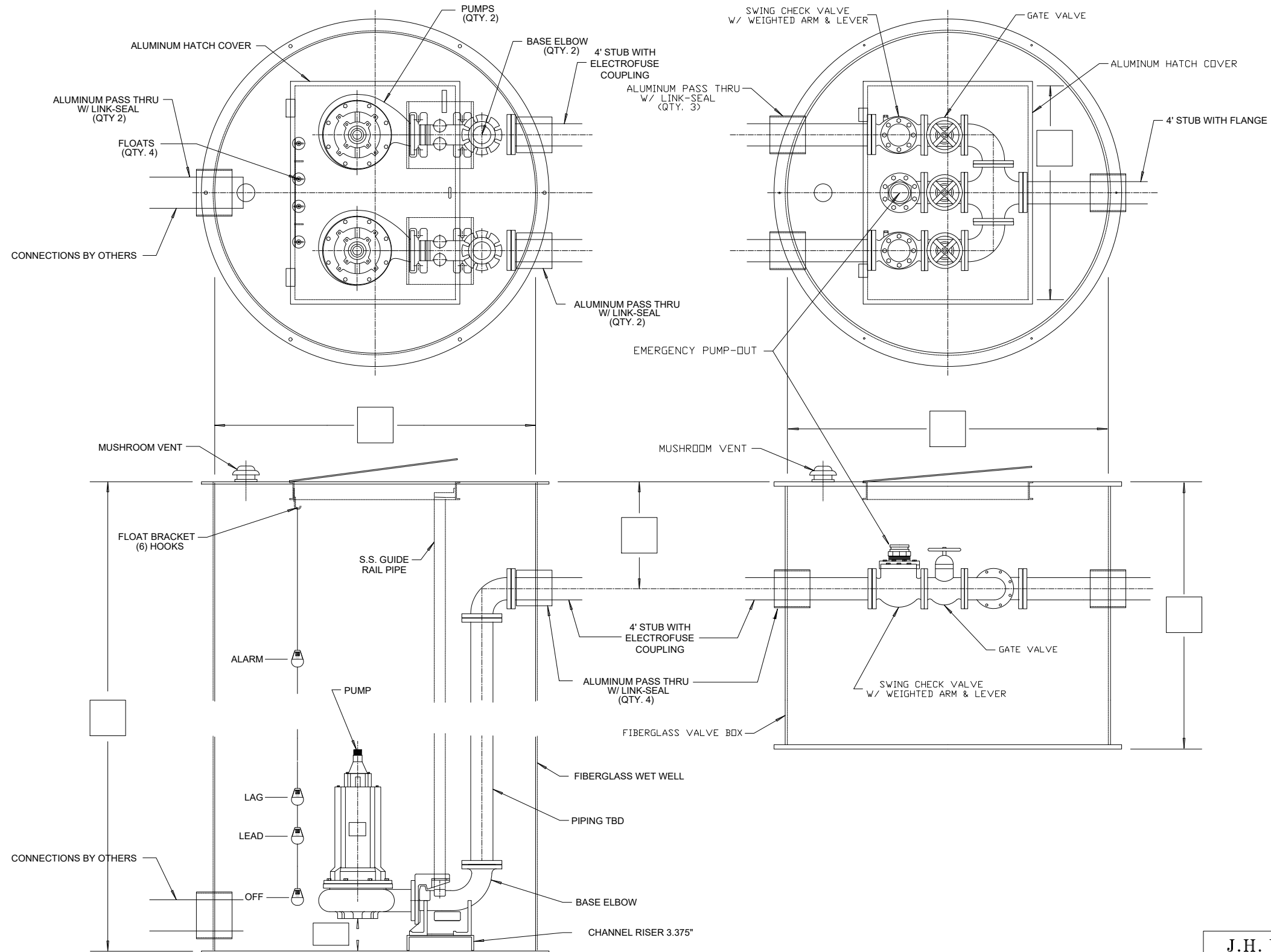




BALDWIN COUNTY SEWER SERVICES LOW PRESSURE SEWER SERVICE



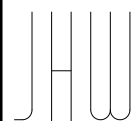
TYPICAL TRENCH DETAIL REMOVE & REPLACE ASPHALT PAVING



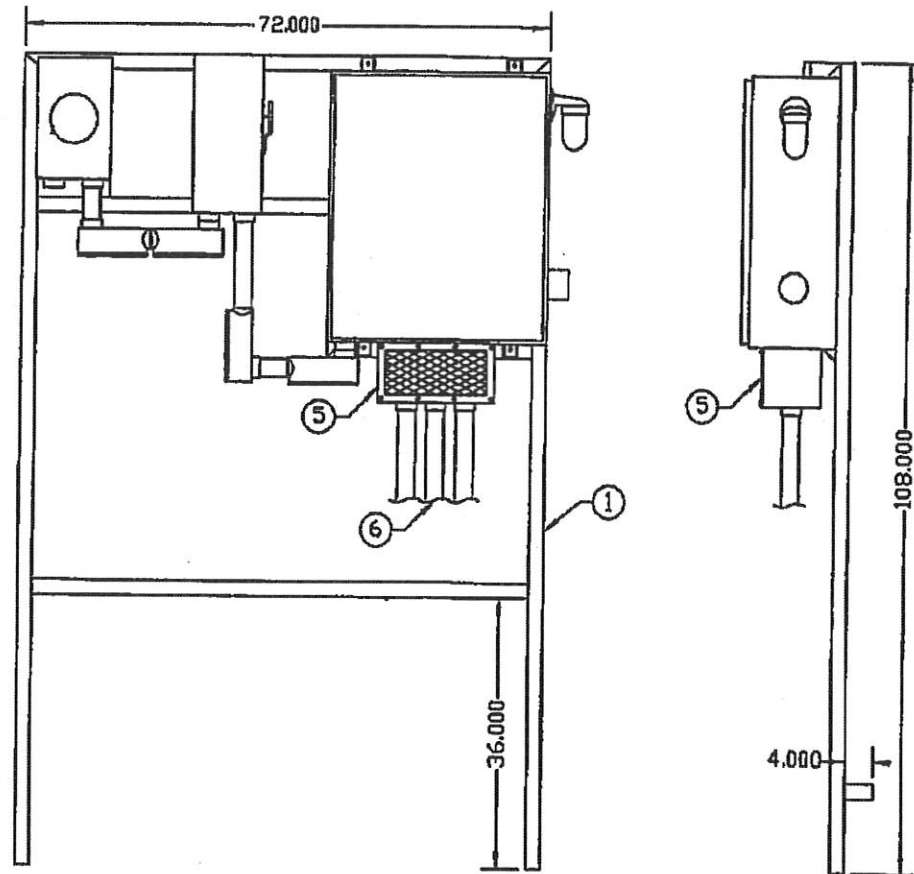
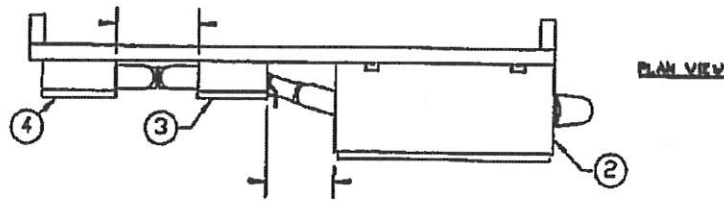
J.H. WRIGHT & ASSOCIATES, INC.
 27395 Pollard Road * P.O. Box 1085 * Daphne, Al. 36526
 Phone: (888) 655-7867 * Fax: (251) 621-8111

		DATE	APPROVED BY	DATE
DRAWN	ZACH FARRIS	05-20-20		
CHECKED				
DESIGNED				

DRAWING NO.	SCALE	REV
	NTS	0



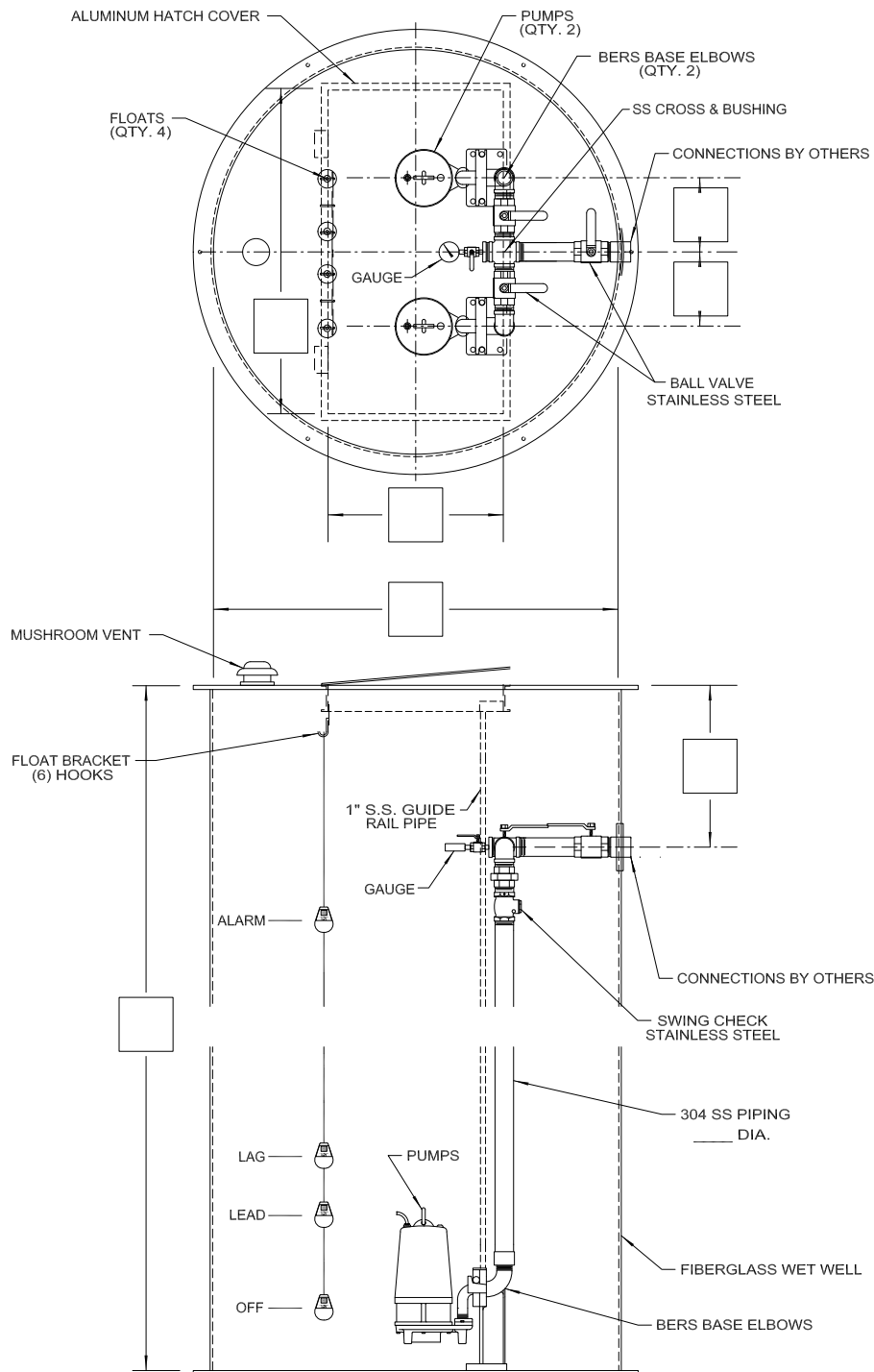
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RIGHT SIDE VIEW

ITEM	QTY	DESCRIPTION
1	1	PANEL STAND, 304 SS, 2" X 2" X 1/8" TH, SQUARE TUBING, 9FT H X 6FT W
2	1	CONTROL PANEL, AS REQUIRED BY JOB SPECS
3	1	MAIN DISCONNECT, AS REQUIRED BY JOB SPECS
4	1	METER BOX, AS REQUIRED BY JOB SPECS (THIS ITEM NOT SUPPLIED OR MOUNTED BY J.H. WRIGHT & ASSOCIATES)
5	1	JUNCTION BOX, 304 SS, WITH EXPANDED METAL FRONT COVER, AS REQUIRED BY JOB SPECS
6	3	CONDUIT, RUNNING BACK TO WET WELL, 2 FOR PUMPS, 1 FOR FLOATS

TYPICAL STAINLESS STEEL CONTROL PANEL STAND



J.H. WRIGHT & ASSOCIATES, INC.
 27395 Pollard Road * P.O. Box 1085 * Daphne, Al. 36526
 Phone: (888) 655-7867 * Fax: (251) 621-8111

		DATE	APPROVED BY	DATE
DRAWN	ROBERT O. BROOKE	03-03-20		
CHECKED				
DESIGNED				

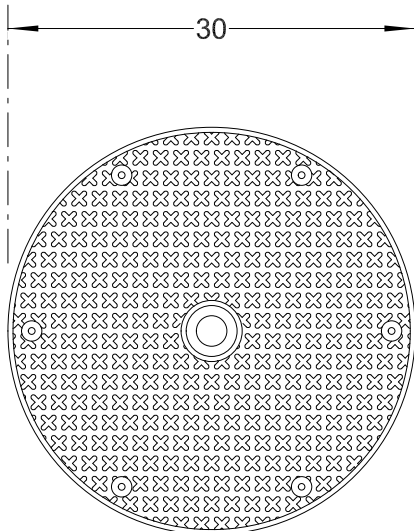
**TYPICAL GRINDER PUMP WET WELL
 ARRANGEMENT - FIBERGLASS TANK**

DRAWING NO.	SCALE	REV
BCSSDUPG-2020	NTS	A



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BCSS VERSION



SOLID FIBERGLASS LID

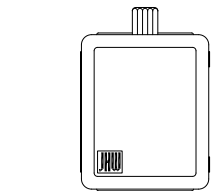
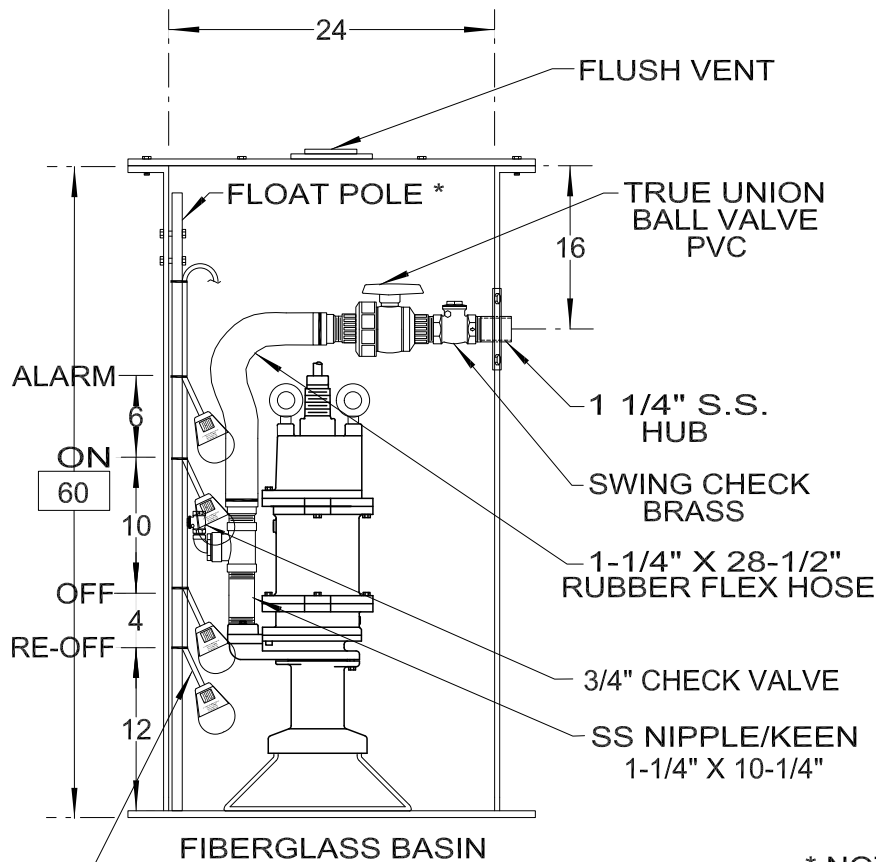


INVERT
4" GROMMET
(SHIPPED LOOSE)



CONDUIT
1-1/2" GROMMET
(SHIPPED LOOSE)

LIFTING ROPE (18FT)
(SHIPPED LOOSE)



SIMPLEX PANEL
4 FLOAT
KPC - LRD16

* NOT ACTUAL LOCATION

3-1/2" TETHER LENGTH ON FLOATS

J.H. WRIGHT & ASSOCIATES, INC.
27395 Pollard Road * P.O. Box 1005 * Daphne, AL. 36526
Phone: (888) 655-7867 * Fax: (251) 621-8111

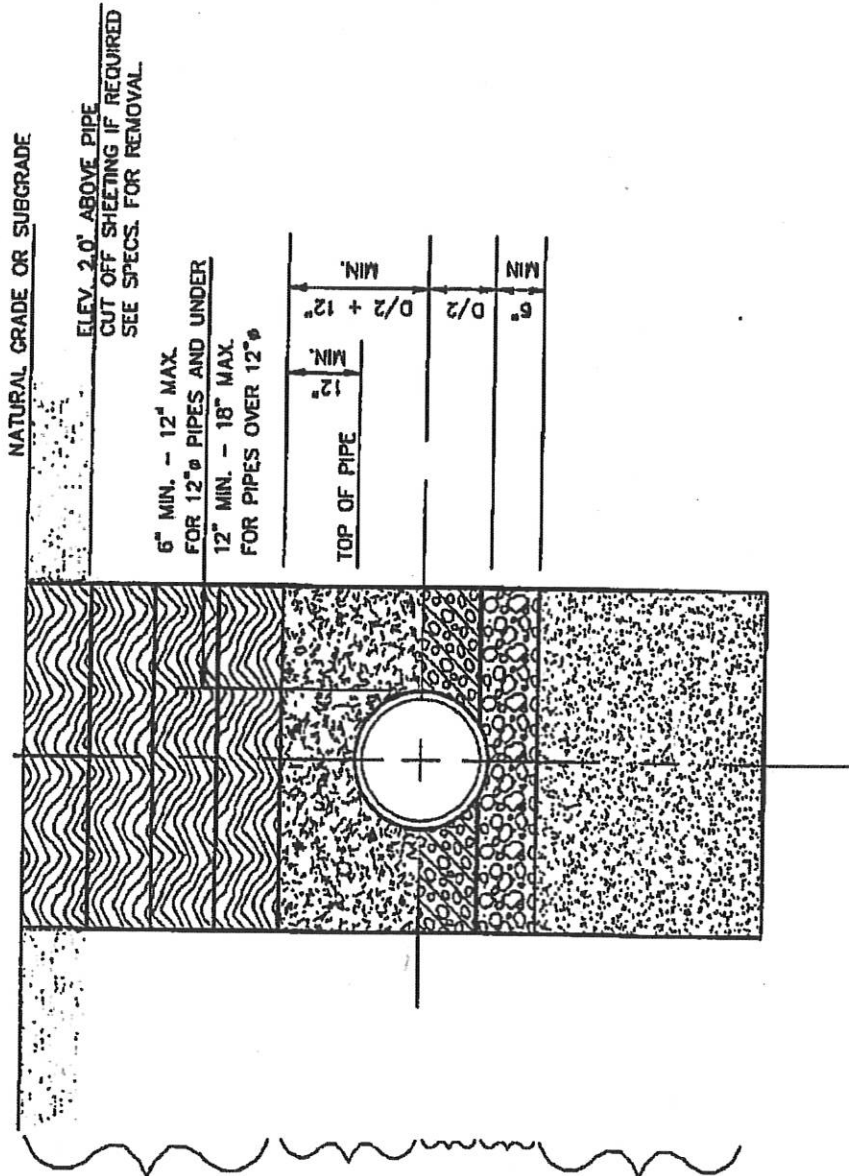
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DRAWN	ROBERT O. BROOKE	05-14-15		
CHECKED				
DESIGNED				

**JHW KEEN PC PACKAGE-BCSS
KPCGHS - 24 X 60 BASIN**

DRAWING NO.	SCALE	REV
KPCGHS SIMPLEX-BCSS	NTS	A



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BACKFILL TO BE COMPACTED TO 100% T-99. LIFT THICKNESS MAY VARY DEPENDENT UPON MATERIAL, EQUIPMENT, AND COMPACTION METHODS USED, BUT IN NO CASE SHALL EXCEED 12". DENSITY TESTS TO BE TAKEN IN ACCORDANCE WITH THE GOVERNMENTAL AGENCY HAVING JURISDICTION, OR AS MAY BE REQUIRED BY THE ENGINEER.

BEDDING AND BACKFILL WITH SELECTED MATERIALS HAND PLACED AND COMPACTED IN 6" LIFTS UTILIZING METHODS APPROVED BY THE ENGINEER.

AS PER SPECIFICATIONS

BEDDING AS PER SPECIFICATIONS & AS REQUIRED BY THE ENGINEER

OVERCUTS AND/OR UNSUITABLE FOUNDATION MATERIAL SHALL BE FILLED/REPLACED WITH SPECIFIED MATERIALS

TYPICAL GRAVITY SEWER MAIN TRENCH DETAIL

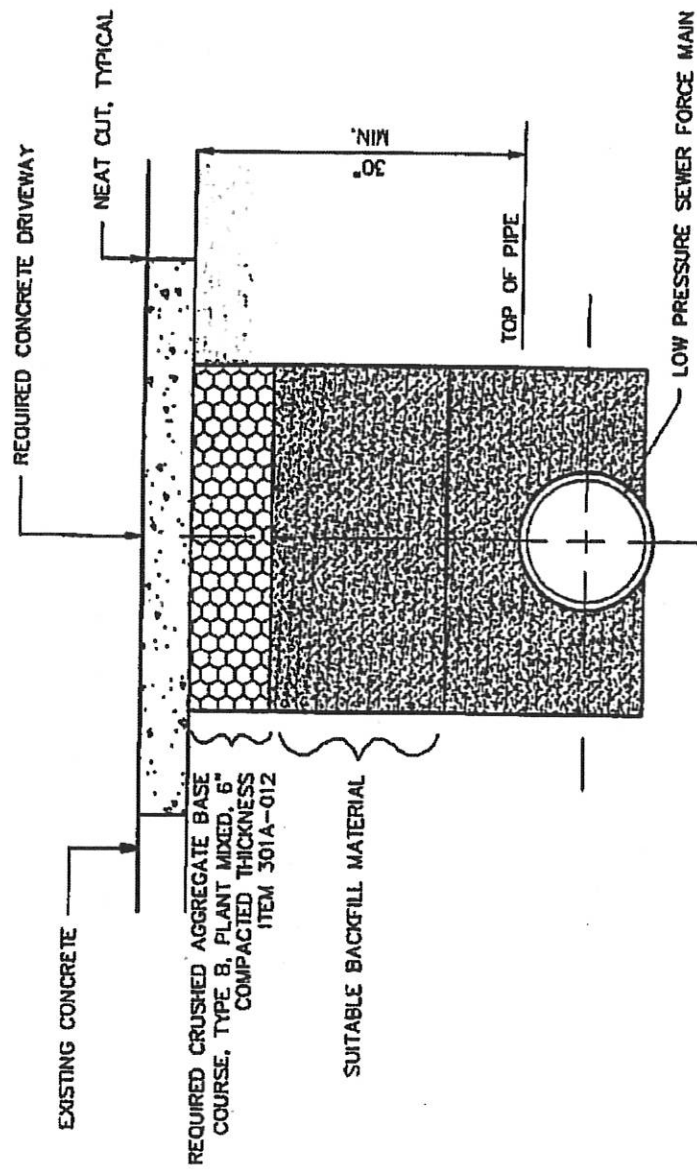
NOT TO SCALE

NATURAL GRADE OR SUBGRADE

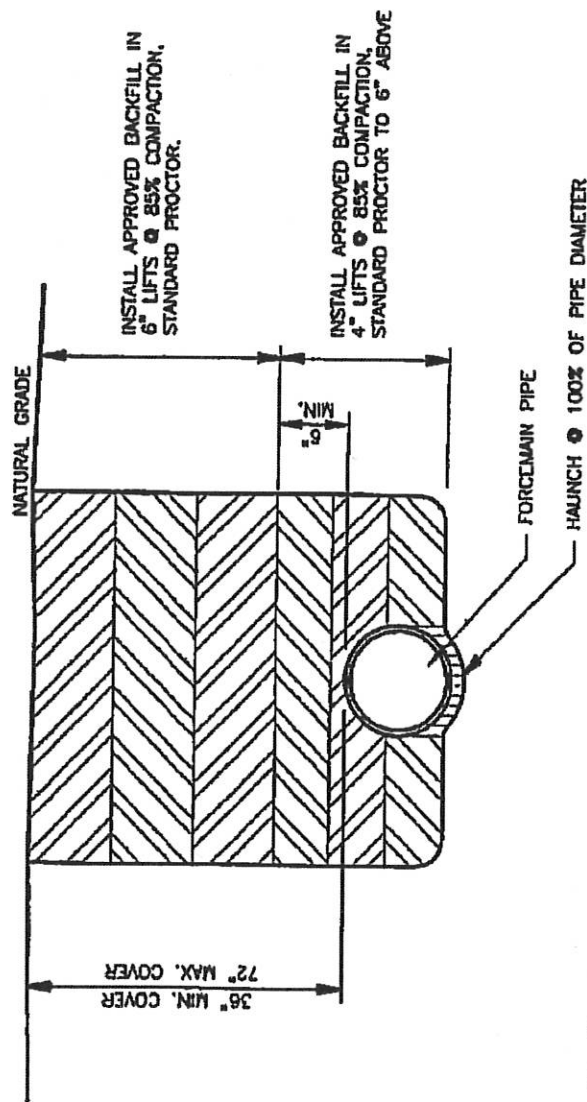
ELEV. 2.0' ABOVE PIPE
CUT OFF SHEETING IF REQUIRED
SEE SPECS. FOR REMOVAL.

6" MIN. - 12" MAX.
FOR 12"Ø PIPES AND UNDER
12" MIN. - 18" MAX.
FOR PIPES OVER 12"Ø

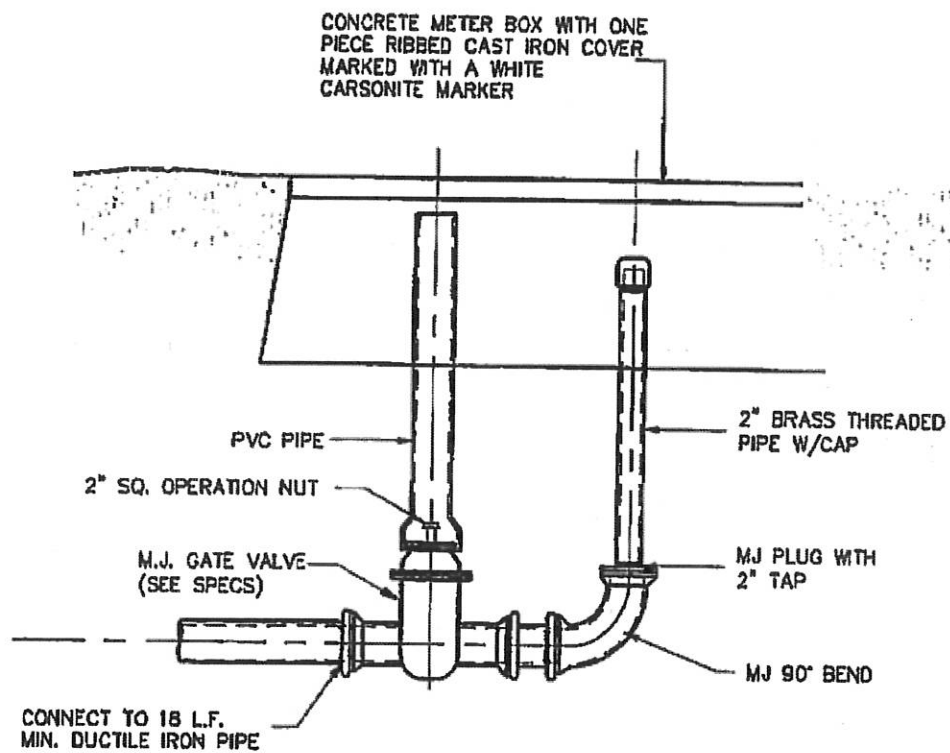
TOP OF PIPE	12" MIN.	D/2 + 12" MIN.	6" MIN.
		D/2	



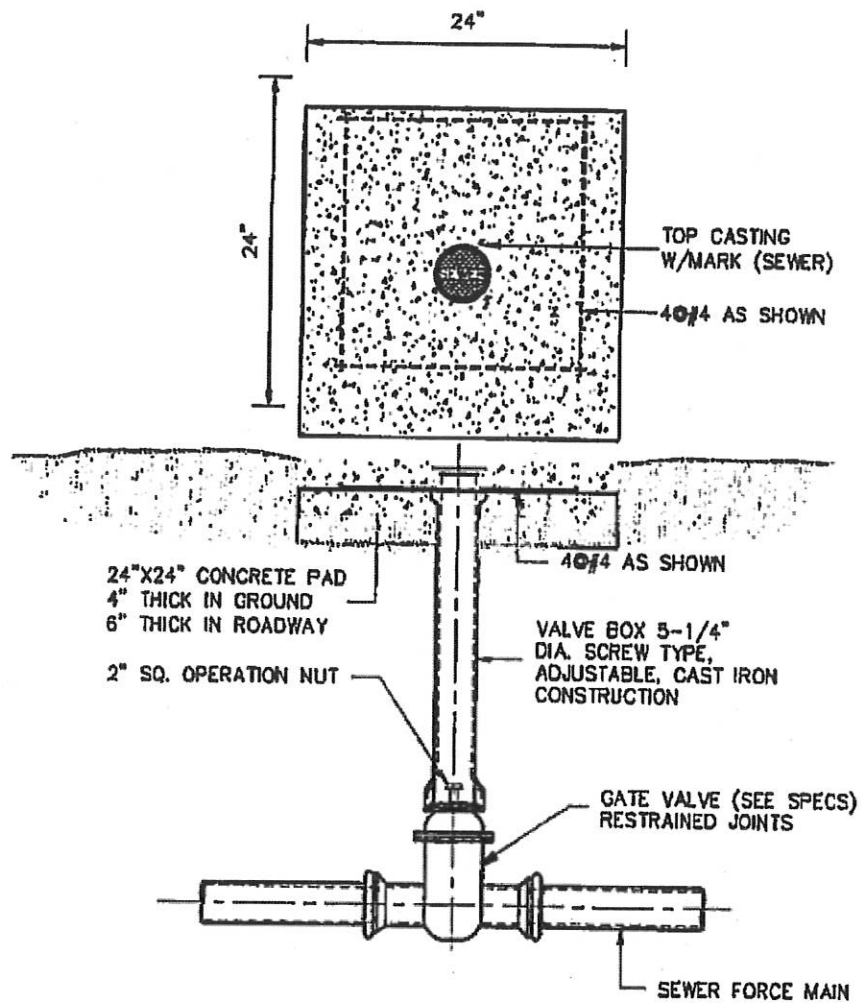
TYPICAL TRENCH DETAIL REMOVE & REPLACE CONCRETE PAVING



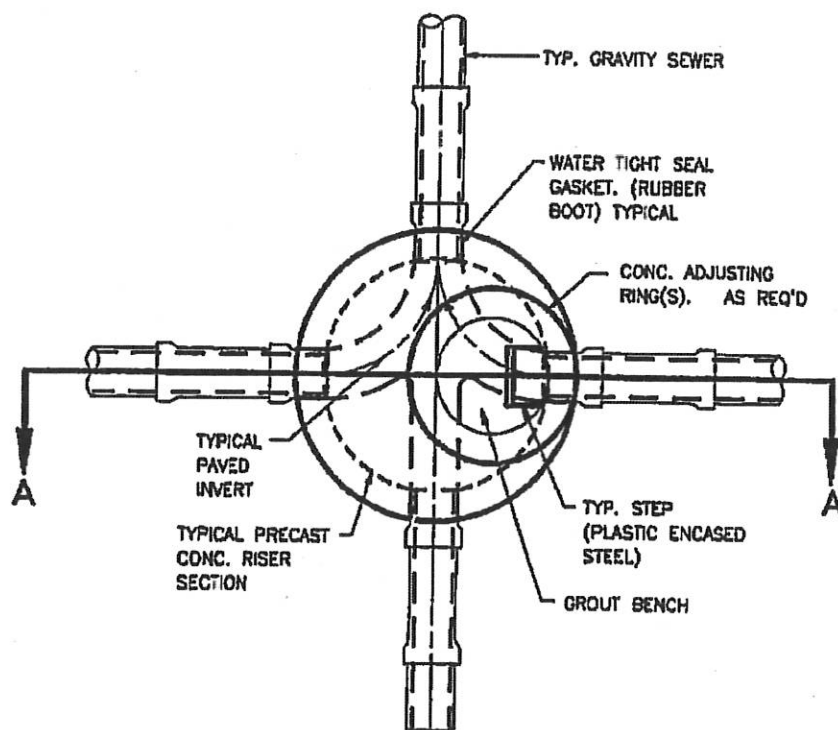
TYPICAL FORCE MAIN TRENCH DETAIL
NOT TO SCALE



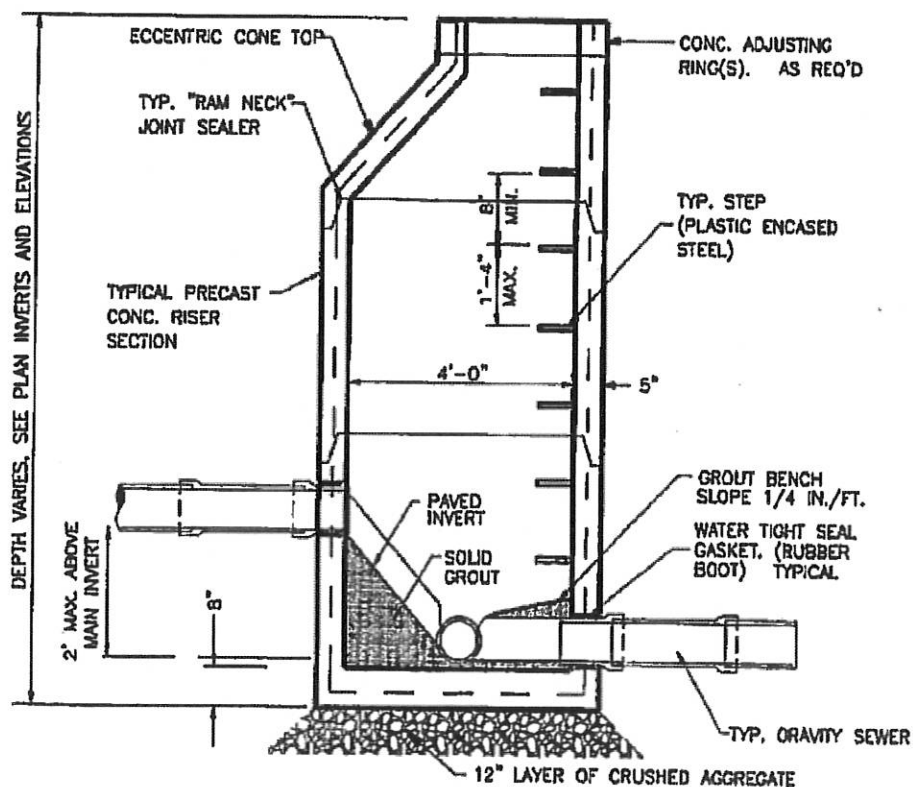
FLUSHING STATION ASSEMBLY



SEWER GATE VALVE

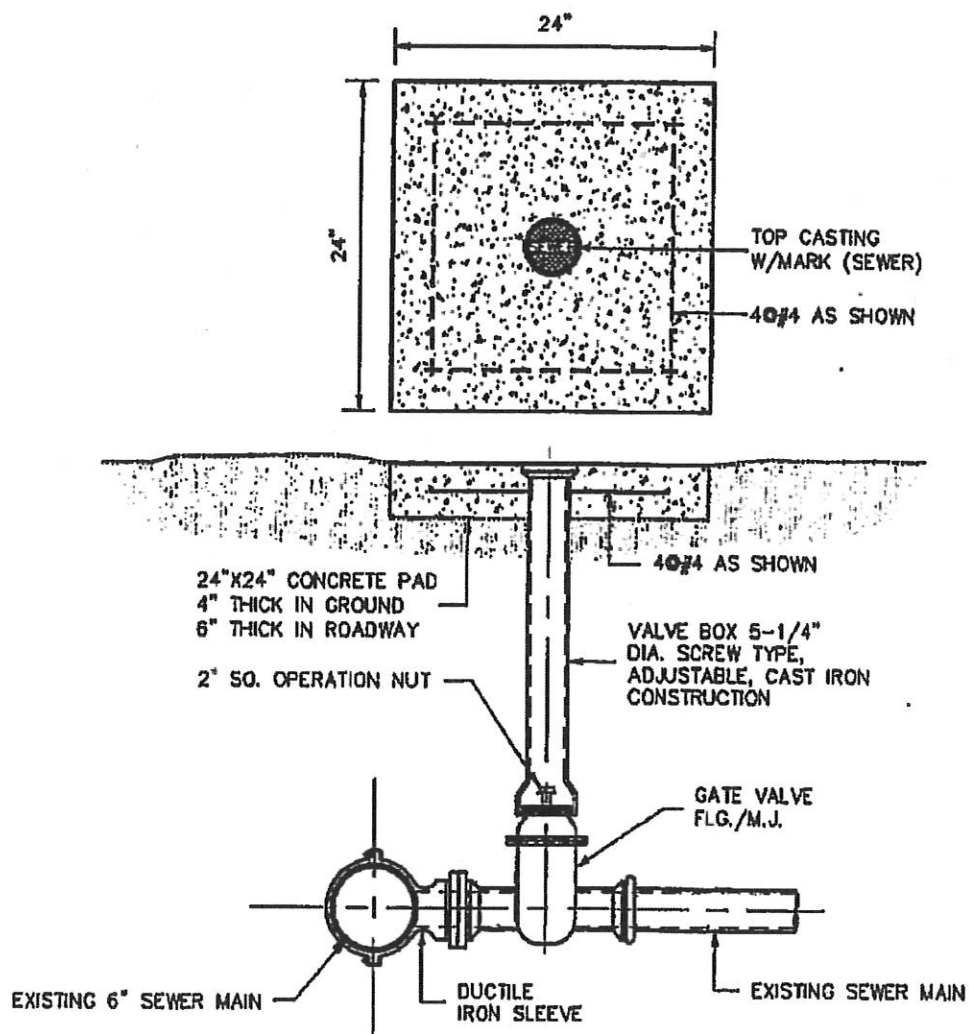


PLAN VIEW



TYPICAL PRECAST CONCRETE MANHOLE

SECTION A-A



SEWER TAPPING SLEEVE & VALVE ASSEMBLY